The Builder.

VOL. XXXII.—No. 1621.

Our Knowledge of Hydraulics.

KNOWLEDGE of the science of hydraulics is one of the most difficult and important of all the acquisitions of the engineer. The subject is one of which the delicacy is equal to the importance. It lends itself, on the one hand, to the most profound mathematical investigation; while, on the other hand, it often presses for the most rough-and-ready solution in daily practice. It is the key of sanitary engineering. The supply and flow of our rivers, the amount of rainfall, and (what is of far more moment than the actual descent) the quantity of that fall that betakes itself to the ascertainable water-way of river channels, are matters of vital importance to be known and understood.

Let none of our readers think that we are speaking on theoretic grounds alone. It is from no wish to insist on the mathematical form of the problem, and to undervalue the importance of the practical part, that we now write. We will mention one fact, which is more eloquent than any argument we can frame, in stating that we have yet our A, B, C to learn as to the hydraulic system of this country. The quantity of water that is annually drawn from the Thames by the five great water companies that supply London from that source, is pretty accurately known. Is it credible that there should be a doubt, not in the minds of those unacquainted with engineering subjects, but in the minds of those who write to instruct the public upon them, or who offer evidence before commissions of inquiry, as to the proportion of the total volume of the river borne by the quantity of water thus abstracted? Yet such is the case, and that to an extent that is perfectly wild. It might be tedious to give all the details which lie before us as we write; but the upshot is, that while the eighty millions of tons of water that are thus abstracted form, according to the Report of the Royal Commission of 1869, only about 1-25th part of all that falls over Teddington weir, they amount, according to another statement, to fully an eighth part of the quantity that so falls when the Thames is at its lowest. So prodigious a discrepancy is enough to show that the subject of river hydraulics is not one as to which the engineers of Great Britain have any great reason to feel satisfied with their acquaintance.

In fact, we have far better opportunities in this country for studying tidal phenomena than for mastering those of rivers. Our coasts are swept by tides of almost every variety known to observation. About Yarmouth, and the eastern part of Norfolk, they are so feeble as to some extent to resemble those of the Mediterranean. Yet in the estuary of the Thames they attain a considerable height. Again, in the Wye, at Chepstow, occurs a tide higher than is known to rise on any shore whatever, except it be that of the Bay of Fundy. From that formidable and destructive phenomenon which is known as the surf, and which, on the Madras coast, rushing up in a single and unexpected wave from the sea, inflicts such sudden damage, we are for the most part happily free. It is within our knowledge that, now some years ago, when tenders were asked for for the construction of an iron pier on the Madras coast, it was required by the specification that three engineers, each competent, in case of need, to take charge of the erection, should come out together with the ironwork. The main reason for that unusual demand was said to be the risk, not so much of the climate, as of the carrying off the directing officer by the surf. But even in this aspect the shores of Great Britain are not without their occasional phenomena of magnitude. Although of rare occurrence, yet one of the most striking of estuary movements is sometimes to be observed in the Severn. When south-westerly winds coincide with equinoctial spring tides, a *ſlôt*, or bore, such as that which occurs on the Seine, is visible below Gloucester, on the Severn. And the stone pier that runs out near the castle cliff at Scarborough was swept, a few years ago, by an unexpected wave from the north, that carried off a gentleman, whose death produced much sensation at the time.

The great points which are of value for the acquisition of positive knowledge as to river phenomena are less ascertainable on our island. For, although we are accustomed to regard the Thames, Severn, and other sister streams as large rivers, such is not their position in regard to the river systems of the world. The area of our island, if its whole water-shed were emptied by one large funnel, is small compared with the collecting grounds of some of the vast rivers of the New World; to say nothing of that which keeps up the African marvel, the perennial flow of the Nile; while at the same time supplying the no less mighty stream of the Congo. Over the smaller area, again, the rainfall is insignificant, compared with that which deluges the Equatorial mountains. At one spot, indeed, which is known by the quaint name of Styehead Pass, a register of rainfall gives an annual depth that is almost tropical. But our physical maps divide the surface of the country into districts receiving from 25 in. to 45 in. of annual rainfall. Of this comparatively small amount of water, which runs by three versants to the sea, and which thus nowhere accumulates in one river outlet of a length of more than some 200 miles, the proportion which actually thus discharges itself is, at this moment, unmeasured and unknown.

Great changes of condition are among the elements of physical observation which are the most precious to the observer. But no less important are the phenomena of permanence and of durability. There is yet another element which, in hydraulics, is of extreme importance, and that is magnitude. The volume of a river is a subject of extreme importance. From an accurate study of a really great river it is possible that facts may be ascertained, which will throw light on obscure phenomena in the behaviour of smaller rivers. To reverse the method is less satisfactory. And when, as is but too much the case, we commence the study of hydraulics on yet smaller proportions; when from the flow of water through pipes, or narrow artificial channels, we construct *formulæ*, which we afterwards apply to the movement of great masses of water, we follow an absolutely non-scientific method. Our present theories as to river hydraulics are tentative and empirical, to a degree that greatly impairs their value.

Our absence of thoroughly sound knowledge on the subject of river hydraulics is unfortunately illustrated by the opposition which is often raised to the reclamation of low-lying land from tidal waters. On the banks of the Forth, the Tay, and the Clyde, many hundreds of valuable acres have lately been added to the area of Scotland by embankments. The drainage of thousands more has thus been rendered practicable. The great obstacle to the extension of this truly national and patriotic work, has been the fear of the vague and undefined rights of the Crown to the foreshore. But this legal difficulty would, there is good reason to suppose, have been removed by this time, but for the fallacious arguments brought forward, to the effect that the channels of the river would be silted up if the funnel-shape of its mouth were interfered with. The very reverse is the outcome of experience. Still, we have no man, and no work, of sufficiently eminent authority, to lay down, on this subject, the law which is not that of Parliament, but that of nature.

We have repeatedly called attention, in these columns, to the general problem of the right distribution of the most precious gift of Providence, next to the light of the blessed sun itself, to this country,—an abundant and neglected rainfall. Very lately a writer, dating from beyond the Forth, has been attacking in detail that which we have attacked in mass. The valley of the Blackwater is the spot to which attention is thus called, by one who is acquainted with its nature and condition. Twenty thousand acres in that valley, which are now worth about 15s. an acre of rent, would be worth 3*l.* per acre if drained. As it is, one half of this area is submerged by every flood; and the other half has the water so dammed back upon it that all the ditches are stagnant during winter, and the herbage is all sour accordingly. During the summer, this land will scarcely carry cattle; and the hay made from it is only fit for half-starved, hungry beasts; while the inhabitants live in cottages where the water is often level with the floor. For some forty miles above its junction with the Thames, the valley of the Kennet is liable to very similar remarks. Reeds and rushes grow, owing to the barbarous method of flooding, or rather swamping, the undrained meadow lands, where the richest grass would repay ordinary care. The waste of productive power in what might be land of extraordinary fertility, entirely independent of drainage from a season of drought, is positively lamentable. The whole cost of deepening and straightening the river, in the case of the Blackwater, it is estimated, would be recouped by the increased production within five years. We cannot doubt that the same would be the case with regard to the valley of the Kennet. For men who wish to make money, not by wild speculation, but by the profits of assured industry, invested on English soil, these valleys offer the means with absolute certitude.

We have given an instance, in a variation of more than two hundred per cent., in professional estimates of the volume of the Thames, of the backward state of our practical knowledge of hydraulics. If we look at the rules and *formulæ*, as given by our best text-books, we shall see that they do not advance the student beyond guess work. "To find the *volume of flow* of a stream," we are told to "multiply the mean velocity by the sectional area." That, of course, is irreproachable. But how to find the mean velocity? That question is one that demands a series of well-connected and perfectly-performed experiments; experiments that can only be satisfactorily carried out by special instruments, and with the utmost care. But so far from this important truth being indicated in our text-

books, we can there only find theoretical rules as to the "relation between head and velocity." This is expressed in a *formula*, which we suppose that we may regard as the basis of our actual river engineering. We find no reference to observation in the *formula*.* The force of gravity expressed by the head of water, is all that is brought forward. When the "factor of resistence" is introduced into the equation, the same purely theoretical mode of treatment is still continued. But this is not the worst. We find positively erroneous statements added. We have a rule, thus conceived, "In a stream like a river channel, the *ratio* of the mean velocity to the greatest velocity (which occurs at the middle of the stream) is nearly equal to the greatest velocity *plus* 7·71 ft. per second, divided by the greatest velocity *plus* 10·28 ft. per second." Now it is not only the empirical and utterly unscientific vagueness of this statement which we condemn. The few words within the parenthesis contain just one of those mischievous assumptions which are the parents and propagators of error. Nothing can be more wide of the mark. The velocity may be greater at the centre of the stream than elsewhere. But, on the other hand, it may not. The actual fact is, that the inclination of the surface of a river being given, its velocity is a function of its depth. So far as we are aware, we shall exhaust all our English text-books on the subject without finding this primary element of calculation anywhere distinctly intimated.

We are indebted to a member of the Institute of Civil Engineers of Vienna, Mr. J. J. Révy, for a great amount of practical light on a subject of so much interest to the sanitary and to the agricultural interests of this country. It is not as a matter of theory that Mr. Révy criticises our hydraulic *formulæ*. Nothing can be more modest; but at the same time nothing can be more thorough, than are the observations of this very careful engineer. It seems that Mr. Révy has been employed by the Government of the Argentine Republic to report on the estuary of the Plata, and the gigantic rivers which pour into it. Of these, the mother stream, the Parana, is, with the exception of the Amazon, the largest in the world. In twenty-four hours it sends down to the sea a volume of water equal to that discharged by the Thames (as at present estimated) during an entire year. It soon became evident that theoretic *formulæ* were absolutely nowhere in presence of these circulating seas of water. No basis of calculation was to be arrived at from estimates of velocity due to head. Nay, more, it became apparent that it was no simple matter to ascertain what that head actually was. We are accustomed to place considerable reliance on the spirit-level. With a good instrument, in good repair and adjustment, a calm day, an experienced and careful observer, and the rigid use of equi-distant back and fore sets, considerable accuracy may be thus attained. We should say, as far as our own practice bears upon the subject, that a level thus obtained may be relied on to about three-hundredths of a foot per mile. That would be considered a fair check. In setting out masonry by the spirit-level, perhaps a greater degree of accuracy may be attained; but the process is slow and tedious. We can remember an instance in the case of the setting out of the retaining walls between Camden-town and Euston-square, on the line of what was then called the London & Birmingham Railway, in which, although unusual care was taken, and the levels were read on iron wedges driven into the joints of the brickwork, day after day they *would* come three-hundredths of a foot wrong! The fact was extremely perplexing. Every endeavour was made by careful adjustment of instrument, and laborious detail of observation, to detect the source of error; but day after day it recurred. At last it caught the attention that the error was always of the same amount, and always in the same direction. This led to a renewed investigation. The result of this was, that the error was not cumulative. Although it recurred in the work every day, it did not augment. This led to the running of a new series of levels along the plinths of all the pilasters that were completed. The fall was exact in every instance. At last, by reference to a bench mark fixed for the purpose, it became evident whence the difficulty arose. It was due to nothing but the *expansion of the concrete* on which the wall was built! The levels were always given at the same period of the growth of the wall; that is to say, on its arrival at the plinth. The same degrees of expansion in equal thicknesses of concrete had thus always taken place. This was, as it turned out, at once a beautiful proof of accuracy of work, and a valuable note as to the behaviour of concrete. But it is an instance of the mode in which, with all the appliances of modern civilisation, we may approach the limit of instrumental accuracy in the use of the spirit-level. Over long marshy districts, jungle, swamp, or fen country, such as we find in Norfolk, the level becomes almost useless. We do far better to trust to a natural water-level, if this is shown, by the absence of current, to exist, than to rely on the use of the spirit-level, even in many parts of England. By the side of the vast rivers of America, or of Africa, such levelling is altogether out of the question.

We have spoken of three-hundredths of a foot per mile as being as fair an approach to accuracy as we can expect under ordinary circumstances. In our fen districts the *minimum* fall allowed for the water-channels is 4 in. per mile. The wind will stop the flow of water through the dykes, if propelled by a less head than that. The constant service of windmills, pumping day and night, and the entire system of polders, dykes, sluices, and outfall, are calculated on that gradient. Its ascertainment is, as we see, within the limit of instrumental accuracy.

Now the surface inclination of the La Plata River happens, by a remarkable coincidence, to fall within a very minute fraction in that very limit of instrumental accuracy. Three-hundredths of a foot is the same thing as thirty-six-hundreds of an inch. The surface inclination of the La Plata was ascertained by Mr. Révy to vary from ·342 to ·444 in. per mile, and with a gradient that in our fen districts would not overcome the opposing force of a moderate wind, the mighty volume of that great river has a surface velocity of more than 100 ft. per minute.

Into the further investigation of this great problem our limits will not allow us now to enter. But we hope that we have said enough to call the attention of all those who take interest in hydraulic knowledge to the fact, that a problem exists, and that its solution, if attained, is not to be found in our text-books, or expounded by our professors. It is no vagary of nature that impels the mighty stream of the Plata down an incline almost imperceptible to our instruments, and which our fen-draining engineers might afford to neglect. In fact, they might neglect it with safety. The cause of the apparent anomaly lies in the great depth of the American river,—a depth of 24 ft. at the section observed. To this depth is due the velocity of the current, and the constant displacement of an enormous mass of water under the solicitation of a minute gravitating force that would prove inadequate to overcome resistance in a shallower channel. We cannot give, in a few words, a more distinct proof of the importance of regarding depth of channel as a function of the velocity of rivers; and the fact that this function is entirely disregarded by our *formulæ* may perhaps account for the fact, that one hydraulic authority (as things go at present) tells us that the flow of the Thames is considerably more than double of that at which it is stated by another engineer.

* The formulæ are $h = \frac{v^2}{2g} = \frac{v^2}{64\cdot4}$, and $v = 8\cdot025\sqrt{h}$.

HOUSE PROPERTY IN ENGLAND AND THE CENSUS COMMISSIONERS.

IT will be remembered that an estimate was made some time ago, in the pages of this Journal, as to the value of house property in England and Wales. We now have, in the fourth volume of the Census returns, just published, the official estimate of this class of property. It will be seen that though the official figures are not the same as ours, the difference, considering the vastness of the total and the difficulty of obtaining precise data, is comparatively trifling. The Commissioners observe:—A census of a civilised nation,—which is always a nation living in houses,—is scarcely complete without a full classified account of those various structures. That distinction and classification are required is evident; for what differs more than a mud hut, a thatched cottage, a farmhouse, the squire's hall, a shop occupied by a tradesman, a public-house, a lodging-house, and a dwelling-house, well fitted with all modern appliances, in the best end of a city? One dwelling barely affords shelter against the weather, has a hearth and a floor; another has fire, light, and water at command in all seasons, cooking apparatus in kitchens, sweet cleanliness in all the offices, stores, pleasant chambers, libraries, and rooms—some fitted for hospitality, and others for the bright gatherings of society. Houses in towns like London differ extremely in form, cubical content, windows, apartments, doors, and sanitary appliances in different quarters; but in England, we have not, under the Act, the same power of inquiry as was conferred under the Irish and Scotch Acts. The enumerators were, however, supplied with books in which they were requested to describe the houses at which they left householders' schedules prior to the Census-day, and to state whether they were private houses or public-houses, bakers', grocers', or any other shops; schools, coach-houses with rooms over, lodging-houses, and the like; those books thus contain information which may be hereafter analysed with advantage.

The Census returns of England since 1801, distinguish only inhabited houses, uninhabited houses, and houses building.

The enumerators of the United Kingdom were instructed as in 1861, in conformity with the decision of the Statistical Congress, to class under "house" every habitation, "each separate house comprising by definition all the space within the external and party-walls of the building." The confusion arising from counting "flats" as houses it was believed would be thus obviated.

The popular use of the word "house" is quite in conformity with the above definition, and the word has probably been applied in the same way at all the Censuses. Assuming this to be so, the mean number of persons to a house rose from 5·64 in 1801, to 5·75 in 1821, when the increase of population was at a maximum, and then declined to 5·33 in 1871. Thus in 1821, there were 575 persons on an average to 100 inhabited houses, and 533 in 1871.

This average gives a very imperfect notion of the actual house accommodation, and some such further inquiry may be made as was commenced in the Census report of 1861, showing in only fourteen selected sub-districts how many houses contained 1, 2, 3, 4, up to 81 inhabitants. The importance of the determination is apparent: of 48,273, 2,417 were uninhabited, leaving 45,856 houses inhabited by 5·63 persons on an average; but 1,501 contained only *one* person, 5,361 contained *two* persons, 7,048 contained *four* persons; 16 contained from 51 to 64 persons; and one lodging-house was filled by 81 people. The facilities for the spread of zymotic disease and the morality of the people are very much influenced by the accumulation of large numbers in lodging and other houses. The importance of minute information of this kind to the Legislature may be illustrated by a single instance: if the same proportion of English houses are occupied by *one* person in 1871, as in the houses inquired into at the previous census some 10,000 or more houses are inhabited by one solitary person. These hermits of the century in town and country sometimes die in their solitude, and occasionally no witness under the present state of the law can give such information as authorises the registrar to record their deaths. Such deaths consequently remain unregistered if the coroner refuse to hold an inquest on their bodies.

Although we have not been able to classify the houses adequately, the Inland Revenue returns supply the means of determining the number of houses of 20*l.* annual value and upwards, subject to the house duty, in 1862 and in 1871. The number of such houses was 519,991 in 1862, and 748,719 in 1871; the increase was 228,728 in ten years. The increase in the number of such houses was 44 per cent.; while the increase in houses below that annual value was 290,884, or only 9 per cent. on the ten years. This may be accounted for by a general rise in the price of houses, which has lifted many out of the lower into the higher category; by a rise in the assessed value; or by an increased proportion of good houses in the numbers newly erected.

The variation in the value of houses will give a general notion of the variety of those structures, and we find that while only 778 were valued at 1,000*l.* a year and upwards, 68,737 were valued at 100*l.* a year and upwards. Some may be surprised that the number of such houses is not greater; but conjecturers are often much mistaken in their guesses at numbers of this kind. So impressed is the mind by a few singular instances of magnitude that it translates it into multitude. The number of houses of 50*l.* annual

value and upwards is 221,632; of 20*l.*, and under 50*l.*, is 527,087.

Concerning the rental of the 3,510,398 houses under 20*l.* of annual value, the return gives no direct information; but the series of numbers increases so regularly as the value descends from 200*l.* to 20*l.* that we have ventured to continue it from 45*l.*—50*l.* to 40*l.*—45*l.* . . . . . to 3*l.*—5*l.*, and subjoin the results to the table: it makes the number of houses of 10*l.* and upwards 2,146,367, or rather greater than the numbers below that annual value. The mean annual value of houses of 20*l.* and upwards was 53*l.* 16*s.*; while the estimated mean value of houses below that figure was 9*l.* 2*s.* The mean annual value of all houses thus determined was 15*l.* 10*s.* in 1861, and 16*l.* 18*s.* in 1871. The mean rental of a house rose from 6*s.* a week in 1861 to 6*s.* 6*d.* in 1871.

The estimated annual value of the houses is 72,176,365*l.* Means should be adopted, as they easily might, for determining exactly the relation between the annual value and the capitalised value of this vast mass of property: this has not been done, but, taken at fifteen years' purchase of their annual value, the houses of England and Wales are worth 1,082,645,475*l.* It was considered a sign of prosperity when houses were fully occupied and new houses were built: so at each Census since 1811 the number of houses "building" has been returned. The number increased from 16,207 in 1811 to 27,444 in 1841, and remained nearly the same in 1851-61; but in 1871 the number ran up to 37,803. One house was "building" or being built to 114 standing inhabited and uninhabited in 1811; to 105 in 1831; to 144 in 1861; to 120 in 1871. The number of houses "building" on the Census day, as we pointed out in 1861, depends not only on the number erected annually, but on the *time* employed in the process, so that a decline in the number enumerated on one day does not imply a decline in the number of houses built yearly. The architect there cited is of opinion that houses on an average are built in six months (1861), but that is by no means certain. The houses building vary with the season; and with the facilities small builders find of obtaining advances of money. But as we know that houses are built in as short a time now as in previous censuses, and as the season of the year has been the same, it is quite certain that the increase of "houses building" to 37,803 on the last Census-day, implies a rapid increase in the number of new houses. This is proved, too, by houses inhabited and uninhabited in ten years having increased by 596,263, that is, at the rate of 59,626 new houses yearly. But new houses were also built in the same period to replace the houses out of 3,924,199 existing in 1861 that fell to decay, or were taken down. Assuming, as was done in 1861, that houses last about a hundred years, and perish at the rate of 1 per cent. annually, then at the end of the ten years 375,223 houses must have disappeared. The new houses built in the ten years replaced these houses, and added 596,263 to their number; so about 971,486 new houses have been built in the ten years, of which about 920,194 inhabited were of the annual value of 14,907,143*l.*, and worth, at fifteen years' purchase, 223,607,145*l.*

While the number of houses "building," increased, so did the number of houses "uninhabited"; the numbers were, 184,694 in 1861, and 261,345 in 1871.

LONDON, BRIGHTON, AND BENGAL.

BETWEEN British poverty at home and Bengal destitution, it would not as a matter of conscience be difficult to choose. Our object in the few words that follow is not to stay the hand of sympathy or benevolence, no matter in what outward or inward direction it may be extended. Strange contrasts are, however, staring us in the face east and west of the great metropolis, and north and south of the kingdom. We are a proverbially charitable people, but our impulses and actions are wayward. The benevolence of London is mighty, but her destitution is still gigantic, and neither our workhouse indoor nor outdoor pauperism affords us more than a partial reflection of it. The readers of the *Builder* have often been introduced to scenes and pictures of London life that few indeed ever suspected had an existence. London is weighted with an aggregate of indigence that has not, and we fear never will have, a register. It is an indigence begot of forced idleness or want of employment, and if ever human sympathy and practical benevolence were exercised rightly in the interests of helpless misfortune, it is in this direction it needs be shown. Want of work means as much want of bread to the poor as a failure of the harvest does.

We learn from Brighton that the pressure of local poverty is so severe that the General Soup Charity has been brought into action, and a public meeting to raise funds has been held on the first day of this week. *Pari passu* with this announcement, in Brighton a meeting is called in the "Queen of Watering Places" to aid the movement in alleviation of the Bengal famine. How passing strange it is that the gay and fashionable resort of our aristocracy and gentry, Brighton,—with its museums and aquarium, with its reviews and its countless cheap trains, with its two seasons for visiting sightseers and dwellers, and with its goodly numbers of well-to-do shopkeepers and traders,—should echo with the mournful cry of poverty. Four years ago we pointed out the wants of Brighton in view of the future, and showed its weak points from its lack of established industries almost of any kind. This is not the first cry of distress from Brighton. Again and again in winter seasons for some years the workhouse and the homes of the workpeople in the town told plainly the tale of want. Local industries are needed for the Brighton of the future; for birds of passage, no matter how great the flock, will never be sufficient to permanently maintain a town. Fashion, too, is fickle and changeful, and the local authorities of the town had better look forward, and, if possible, for the present, find the permanent body of the unemployed some public work.

What is being done now, or about being done, for Bengal, is the very thing that needs to be done, not alone in London and Brighton, but in many places over the country, viz., providing work for the unemployed, under careful arrangement. Besides the ordinary measures of relief, we learn in different districts the Commissioners have been specially authorised to make advances for the digging of wells, and in twelve of the partially distressed districts, and in fifteen of the more exposed, municipalities may apply for loans, and landholders for advances, on easy conditions, for improvements. Where there are village works undertaken before the end of July next, we learn that the State will bear one-third of the cost, if they are likely to prove beneficial to the people,—such as works for water supply. The next two instalments of land-tax may be postponed for two years, while arrears of the first instalment are not to be exacted by legal process. Finally, in all districts, including those where distress shows itself, the Commissioners are at once to provide labour on the roads at whatever cost, to lend to the municipalities and to advance money to landholders under the usual rates.

Very many thousands of pounds will be collected in England for the relief of those suffering from the effects of the Bengal famine, but it never should be lost sight of that as Christians, citizens, and inhabitants of a civilised country, it is our duty to act fairly by our brothers at home while assisting our more distant kindred and strangers abroad. We have had partial famines in these countries once, but, thank Providence, we have not suffered for many years through a failure of our harvests. Withal there is a terrible amount of destitution latent and unknown, as well as ascertained, in this country, and particularly in the metropolis. Charity organisation schemes have their abuses, and, where honest, their action is but as drops of water to the thirsty. Work alone, employment remunerative and useful, affords the safest, the wisest, and the most honest method for relieving the distressed and would-be industrious workers, because it enables them to preserve their self-respect, and prevent the stigma or ban of pauperism being fastened upon them to their own discredit or to the injury of their children.

An Australian Monolith.—As one result of the recent explorations of Mr. Gosse and his party in Western Australia, we learn that they have discovered a huge monolith, 1,100 ft. high, and six or seven miles in girth at its base, and the interest in the discovery is heightened by the fact that a stream of water fed by a spring in the centre of the conglomorate flows from the rock.

THE INQUEST AT THE PANTECHNICON.

AT the inquest recently held, and which we regret to have to say was altogether insufficient and unsatisfactory, Mr. T. Marsh Nelson, who had examined the ruins at the request of the coroner, made a report upon the occurrence. We print the concluding portion:—

"The internal arrangements were most defective. There were no cross walls, no classification of the contents, and combustible material was scattered throughout the building. No appliances for the extinction of a sudden outbreak of fire existed, and there were no hand-pumps, hydrants, or hose, or means of apprising the nearest fire-engine station by telegraph wire. No firemen were kept on the premises, and no organised watchman, and tell-tale clock. The wall which fell upon Sydney Scott was on the western side, abutting upon the Lowndes-square and Lowndes-street houses. Part of the upper portion of the wall had fallen during the fire. On the day after the fire, about six o'clock on the Saturday evening, a large portion of it came down, killing Scott, who was on the Pantechnicon side, and destroying the kitchen, pantries, libraries, &c., on the Lowdnes-square side. This wall, particularly after the warning given by part falling during the fire, ought to have been shored up the first thing on Saturday morning, and there was no difficulty in doing it from the cross walls of the Lowdnes-square houses. Under the 'Dangerous' clauses of the Metropolis Building Act the authorities were empowered immediately to do so. On the Monday following, he was informed, a notice was served on the proprietors of the Pantechnicon, and on Tuesday the Metropolitan Board of Works' surveyor and their contractor proceeded to take down the remainder of the wall. Had the wall fallen in the night-time a more serious loss of life would probably have occurred, as the men-servants in the Lowndes-square houses usually slept in the pantries. His opinion was that there was great neglect in not immediately having this wall shored up in the morning of Saturday. It would have saved a large destruction of property and loss of life. He was also of opinion that the Pantechicon was a most imperfect structure, although it was built under the provision of the Metropolis Building Act. He could not conclude his report without referring to an opinion he gave on an inquiry of a similar nature—viz., the Tottenham-court-road accident (where, unfortunately, six lives were lost). It was extracted from his report to the Coroner for Middlesex, printed, by order of the House of Commons, in July, 1868, and was as follows:—"I think the Government incur a great responsibility in continuing in force an Act of Parliament in the face of frequently-expressed opinions of all parties, from the humblest builder to the judges of the land. It is an Act which legalises bad buildings; it has made London as inferior to many Continental cities as it was formerly superior; and, by its conflicting, and in many cases absurd and contradictory, regulations, it defeats the only object that a proper Building Act should have in view, viz., the substantial construction of all houses and buildings, without any exemptions whatever, the prevention of the spread of fire, and the protection of the inhabitants of the metropolis from such accidents as the painful case now under investigation." Since that date, nothing had been done to repeal or alter the Metropolitan Building Act of 1855, notwithstanding the presentments which had been made by juries; and, as the Board of Works had signally failed to provide any efficient remedy, it was to be hoped that the new Government would be led to give their immediate attention to a subject so important to the metropolis.

A correspondent, signing "One on the Spot," writes to know if it is not obvious that Messrs. Smith & Radermacher have been practising for years a gigantic imposition on the public, and calls for the institution of such measures as may lead to the application of a proper punishment.

We have a strong opinion to the same effect. Depositors have been misled to their ruin. The country itself is damaged by the losses, beyond repair.

THE CENTRAL DOME OF THE VIENNA EXHIBITION BUILDING.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

AT an ordinary general meeting of the Institute, held last Monday evening, the 23rd inst., Sir Gilbert Scott, president, in the chair, the following gentlemen were elected:—Mr. Charles Bayly, Fellow; and Messrs. H. C. Boyes and Ernest Carritt, Associates.

The Secretary (Mr. Eastlake) said that ten candidates had submitted sketches in competition for the Pugin studentships for 1874, and in the opinion of the council Mr. R. C. Page was the successful competitor. In consideration of the excellence of the drawings of Mr. E. J. Munt, he was awarded the medal of merit, Messrs. Bethnall and Wilson being also honourably mentioned.

The candidates' sketches were exhibited.

Mr. Oliver called attention to the case of "Timms *v.* Kerr," a report of which had appeared in the *Times* of that day (Monday), and thought that it would be some satisfaction to the members of the Institute if Professor Kerr could give some explanation of it.

Professor Kerr, after going fully into the facts of the case, said that the profession were, under existing arrangements, at the mercy of their clients; and he hoped that he would be the last man to suffer under the present state of the law; and that when the new Judicature Act came into operation, matters would be somewha

changed; for, under that Act, professional cases would be tried, after the present year, by a jury of paid assessors.

The adjourned discussion on Mr. Scott Russell's paper on "The Central Dome of the Vienna Exhibition Building," which was read at the last meeting, was then resumed.

Mr. Tarn, in opening the proceedings, could not understand how the great strength of the dome was obtained, though Mr. Russell's dome was not the first erected in the conic form, Sir Christopher Wren having made use of it in the building of St. Paul's Cathedral. The same principle might be carried out in the curved form, although it would not have quite the strength and resistance the straight line would have; but that might, however, be overcome. He thought that there might be domes of three conic sections. He did not at all doubt that there was enormous strength in the cone, as could be seen from the way in which it was constructed. A dome was generally considered a curve, both inside and out; and he thought that mode of construction was of the very best that could be used.

Mr. Morris thought there was no doubt but that the conical form of roof was of the most ancient character, and he believed that it was even of earlier origin than the spherical form. So far as the architectural form was concerned, he thought that the cone must be decided to possess the greatest possible inferiority to the spherical form. Perhaps the finest example was the Pantheon. There were now such fine examples in iron construction that they would probably mark a new stage in the architecture and construction of domes. The grandest design must be formed of the iron skeleton case, and it would be advisable, perhaps, not always to be too exacting in showing the skeleton; but they should be content to take the iron for skeleton, and case it with stone and other material which seemed best.

Mr. Curzon said that it seemed Mr. Russell's paper was divided into two parts. The dome of Mr. Russell did not exist in the first portion of the paper, but was rather such a one as was described in the second part, which treated of the history and practical execution of the dome. He (the speaker) thought that it was a building altogether different from the theoretical dome described in the first portion of the paper. The building appeared to have very good foundations, although in the paper they were held in light esteem.

Professor Kerr said that a new light had been thrown on the subject, for he had discovered that the central part was, after all, a dome of vertical and cross ribs, and it seemed that they had got back to the ordinary principle of construction of wooden or iron domes. He objected to many of the points raised in the paper, especially dwelling upon Mr. Russell's depreciation of the ordinary way of using girders and roof-trusses in large buildings. Referring to Mr. Russell's principle of antagonism of agencies, he said that if the skeleton was one agency, and the cone another, if one were to fall, the other must go also. The Albert Hall was built on the elliptical plan, and he had been told that it ought to have fallen long ago, but that it was sustained by some occult principle, which, however, had been contradicted from other sources. He then fully discussed and explained his idea of the usual and accepted mode of employing girders and roof-trusses, and combated very strongly Mr. Russell's portion of the paper in which the advantages of the usual method of using girders was alleged as a "mere modification of ingenious waste."

Mr. Fowler thought that the description in the paper of the actual building was rather more scanty than he should have desired; and he had not come prepared to see, as he had that evening seen, drawings showing that the construction had very large ribs and circles in proportion to the actual surface covered. He thought that the description of the theoretical portion had occupied rather too much space.

Mr. Crace said that Mr. Russell had asked him (Mr. Crace) to draw out such plans as he had described. The principle upon which Mr. Russell proceeded was entirely one of making his construction consistent with what was outwardly shown, and *vice versâ*; and the first design which was submitted by Mr. Russell at Vienna showed a *façade* which, if one might say so, was entirely constructional, and in which elements of plaster and stucco were entirely absent. The whole system upon which the original design was founded was one of brick and stone, supporting the iron cone. The present construction was more or less a sham, and the view presented by the substructure of the dome, as carried out, was quite a sham.

Mr. Bell could not understand what Mr. Russell meant by saying that he could take away a column, or even two or three columns, supporting the cone without the stability of the cone suffering. If such a statement as that were true, they would soon arrive at the period when they would be able to build in the air.

Mr. Penrose said that it was very difficult to apply the pure catenary in any structural theory, for it did not practically exist; and in any arch of almost any shape they could imagine a catenary. He would suggest that the best possible form for a cone would be to give its sides an almost imperceptible entasis, such as was given to the Greek column.

The President said he had been extremely pleased with what he had heard from the speakers, and he thought that the Institute were greatly indebted to Mr. Russell for the ready manner in which he had come forward for their benefit.

Mr. Scott Russell said that the Institute would do him a great favour if, on some future occasion, they would allow him to be the vehicle of conveying some slight compliment to the architects of Vienna who had co-operated with him in the works; and also to explain how the designs that they had made of the building were appreciated; for he was sure that this would be a source of gratification to the architects at Vienna.

FALL OF A FLOOR.

An accident occurred last week at No. 42, Queen's-gardens, Bayswater, which might have been attended with very serious results, and should serve as a warning to builders. Friends had been invited to spend the evening, and were gradually gathering together in the third room on the ground floor, at the back of the house, when—twenty-two persons being present—the floor broke away from the back wall, and descended to the room beneath. The other ends of the joists, being on a partition, remained in their place, and most fortunately no person was hurt. The room is 20 ft. by 18 ft. The cause of the disaster was not far to seek, and the only wonder is that the floor had not yielded long before. The joists were carried by a fillet 3 in. × 2 in., fastened most insecurely by a few nails to the bressummer, which forms the heads of the windows of the room below, and carries the back wall. The practice of nailing on a fillet at the side of a girder or other beam to carry the ends of joists is of most common occurrence, and too often it is done as if with a full conviction that a tenpenny nail will carry St. Paul's. In fact, looking at the grossly ignorant manner in which work is done in the large proportion of houses built in and round the metropolis, it is surprising that more accidents do not occur. It may be as well to inform some of our readers that the Building Act gives the District Surveyor no power over the timbering of a house.

MAINTENANCE OF ASPHALTE ROADS.

In reply to their advertisement offering a premium for a good practical mode of cleansing asphalte pavements, the Central Committee of the Asphalte Companies have received over fifty designs, worked out with more or less care. Many of them are merely suggestions, without drawings or models; but there are several well-considered designs, which it is proposed to exhibit, and some of which it may be hoped will answer the desired purpose.

For watering alone, "Engineer," of Baltic-chambers, submits sketch of a central pipe, laid in the middle of the roadway; and Mr. Daniel, of Brighton, purposes to distribute the water from under the curb; both ideas being apparently founded on Mr. Brown's patent, who has put his system in action in the City.

Mr. Smither, of Hackney-road, proposes a hydrant with a hose, which is wound up inside the pillar; and whatever may be said of the value of hydrants for many purposes, it may be questioned whether, in our narrow footpaths and crowded streets, a hose would not be inconvenient, and it appears more likely that the water distributed by merely turning on a tap in the manner proposed by Mr. Brown, is not only more convenient for road-watering, but cheaper, saving labour and horse-keep, in which case the numerous ingenious designs submitted, which combine the water-cart with contrivances for brushing, cleansing, and even drying the asphalte surface, will be found less suitable than may at first appear; at the same time, many of them may be disconnected with the water-cart, and may be for cleaning purposes just as efficient when water is provided in another way.

The designs submitted by Mr. Vincent Caratte, of King's-cross; Mr. Greenstreet, St. Saviour's district; M. Delano, of Paris; Mr. Waddell, Gravesend; Messrs. W. & A. Arber, of Leytonstone; Mr. Wood, Birmingham; Mr. Muntz, Fetter-lane; Mr. Huntley, Walthamstow; Mr. Harding, of King's Lynn; and Mr. Weaver, of Kensington, are of this character; and some of them provide for lifting and removing, and thus keeping the mud and slush from running into the sewers.

Mr. D'Elro, of the Lambeth-road, moreover, cleanses the surface without the necessity of a water-cart; and so does M. Blot, of Paris.

The committee hope to be able to exhibit the designs.

WOOD UNDER FIRE.

Capt. Shaw, of the Fire Brigade, has described some experiments made on a "story-post, with a section of the beams, and other parts surrounding it, above and below," which had been removed from a warehouse destroyed by fire:—

"This post had been subjected to the full action of the fire during the whole of its duration, as already mentioned, or, making full allowance for everything, including the delay of the fire attacking the particular spot on which it stood, and the time at which the cooling process commenced, certainly not less than 4½ hours.

As we had used large quantities of water, and it was probable that the wood might have been somewhat saturated, I had it carefully dried for several days before a strong fire, until not a trace of moisture remained in it.

I then set it on end in an open yard, exactly as it had stood in the warehouse, with the pedestal underneath, the cap above, and the beam across the cap, placed more than a ton of shavings, light wood, and heavy wood round it, and after saturating the whole heap with petroleum, applied a light to it. After this I kept men pumping petroleum and turpentine on it until my stock was exhausted.

At the end of two hours and a half I withdrew the post, beam, and other parts from the fire, and within a few minutes from the time at which they were withdrawn they ceased to burn.

I then sawed off horizontally a few feet at that part which had suffered most from the flames, and afterwards split the same piece longitudinally with steel wedges in order to examine its condition.

The post was of pitch pine, about the most inflammable wood I know, and yet, after exposure for seven hours to fires the fury of which could not be exceeded except in blast furnaces, it contained, and still contains within it a quantity of perfectly uninjured and apparently fresh wood, probably capable at this moment of supporting the whole weight which the original post can have been designed to carry."

The lesson the writer draws is this:—"A massive story-post of even the most inflammable wood is absolutely and perfectly proof against any heat which can be applied to it, will not of itself burn at all, but requires a continual supply of highly inflammable substances to keep it burning, and, when this supply is withdrawn, ceases to burn; and, lastly, after being exposed for seven hours to flames of very great intensity, is not injured to a greater depth than about 2 in. from the original outer surface, and still shows a centre as clean and fresh as when it was first put in."

NEW GOVERNMENT OFFICES AT POPLAR.

Some years ago the late Mr. Richard Green, shipbuilder, of Poplar, erected an extensive pile of buildings at Poplar, which was for some time known and occupied as "Green's Sailors' Home." Since the death of the owner it was generally believed that the "Home" was about to be taken down and a number of more modern dwelling-houses erected on the site. But it now appears that the building is to remain, the Government having obtained possession of it with the view of converting it into offices in connexion with the Board of Trade department, which has secured the premises under a long lease. Amongst the alterations which are to be made in the building is the construction of a spacious Court for the trial and settlement of questions connected with maritime law.

Architecture at the Royal Academy.—The Professor of Architecture at the Royal Academy, Mr. E. M. Barry, R.A., will deliver lectures, at Burlington House, on March 5th and March 12th.

References to Plan of Carlisle Castle.

A. Keep. B. Inner gate-house. C. Outer gate-house. D. Queen Mary's Buildings. E. Norman tower.
F. Wells. G. Ditch. H. Richard the Third's Tower.

CARLISLE CASTLE.

THE city of Carlisle appears first early in the ninth century, in the history of Nennius, as Cair-Luadiit, or Luilid, or the Castra Luguballia, one of the "octo et viginti civitates. . . . cum innumeris castellis ex lapidibus et lateribus fabricatis," enumerated by that respectable authority. The fame of Carlisle, however, is due neither to this early mention, nor to the subsequent gift of the place by King Ecgfrid to St. Cuthbert, but rather to its name as a centre of the early cycle of Arthurian romance, well supported by its subsequent celebration in Border tales and ballads. In truth, whether in fable or in fact, Carlisle enjoys no mean reputation. It played a part in the British, Roman, Saxon, and Danish occupations of the island, and after having been held as a frontier-fortress by the Scots against the English, became, in its turn, the great stronghold of northern England against the Scots, and the scourge of the wild tribes of the debateable land.

City and castle are naturally strong. The castle occupies a bluff, projecting towards the north, in a position which no doubt created its early, and caused its long-continued importance. Across its front flows the deep and rapid Eden, here seven miles from the sands, and a score from its final disappearance in the Firth of the Solway. Above the city, and covering its eastern flank, the Petterill comes down to reinforce the Eden, which river, close below the city and beneath its walls, receives, by two branches, the waters of the Caldew, which thus covers the flank of the post towards the west.

The city, so protected on the three sides on which it was most liable to be attacked, is built upon ground about 60 ft. above the Eden, and which, slightly rising, terminates to the north in the prominence occupied by the castle, about 50 ft. above the river, and which no doubt is the site of the "Caer," whence, whether of British or Roman origin, the city derives the first half of its name.

Luguballia, or Caer Luel, does not stand upon, but about a mile within, the line of the Roman wall. This great work, coming from the direction of Wallby, and in the line of Linstock and Drawdykes, passed by Stanwix, across the river, to terminate on the Solway, at Dykesfield, near Burgh-upon-Sands.

The castle thus occupies the northern, highest, and strongest part of the city, about 60 ft. above

the river. It is built upon the new red sandstone rock, and to the east, north, and west the slopes are very steep towards the meads, which fringe to a considerable breadth the left bank of the Eden, and the right of the Caldew. In plan the castle area is nearly a right-angled triangle, of which the right angle is to the south-west, and the long side, somewhat convex, and 256 yards in length, is presented towards the north and east. Of the other sides, that towards the city, on the south is 200 yards, and that to the west 143 yards in length. The space within the walls is rather under three acres.

The outer defence towards the city is an artificial ditch, 240 yards long, 30 yards broad, and about 10 yards deep, cut across the high ground from slope to slope, and stopped at each end by the wall connecting the city with the castle, which thus, though an independent work, is made to form part of the general *enceinte*. Between the castle and the city is an open space, about 78 yards broad, which contains the ditch and a broad glacis, and which, with the castle, lies outside the municipal boundary. On the west side, about 45 yards within this boundary, is Irishgate-brow, the site of the Irish gate of the city. The Scottish gate stood on a somewhat similar position on the east side; and the third or English gate, guarded by the citadel, was at the opposite or south end of the city.

The castle is composed of an outer and an inner ward, the keep standing in the latter. The inner ward forms the eastern end or apex of the area, of which it occupies about a fifth, and it is divided from the outer ward by a cross wall, 90 yards long, upon the low salient of which is the inner gate-house. The other sides of this ward are the east, 96 yards, and the south, 73 yards. The keep stands in the south-west angle, about 20 ft. from the two adjacent curtains, of which the south is thrown out about 18 ft. to gain space, and to form a shoulder flanking the outer gate.

The main entrance is from the city in the middle of the south front, 40 yards west of the keep, through the great gate-house. The drawbridge across the ditch was removed in the last century, and is replaced by a bridge of stone, which crosses the ditch and leads up to the *gatehouse*, called John de Ireby's or Irby's tower. It opens into the outer ward.

The plan of this gatehouse is peculiar. It may be conveniently described as a plain structure, 44 ft. square and of 20 ft. projection in front of the line of the curtain. It is composed of a basement and upper floor, but the entrance, instead of passing, as usual, through the centre of the building, is at its east end. The south-east angle of the building is hollow, forming a nook or recess of 18 ft. each way, the two outer sides being walls 6 ft. thick, and about half the height of the main building. These walls are provided with parapets front and rear, so as to form a covered way, which communicates with the east curtain. In front of this inclosure is the outer gate, of 11 ft. opening, with a drop-pointed arch, placed in a sunk square-headed panel, intended to lodge the drawbridge when lifted. This entrance leads into an open chamber 12 ft. square, commanded by its outer walls. It is, in fact, a barbican, niched in a hollow angle of the gatehouse, with outer walls the height of the curtain. The barbican leads to a second archway, with a portcullis in a square groove, and a gate. Then follows a vaulted passage ending in another gate which opens into the ward. In the passage, on the left, is a lancet doorway opening upon a rising well-staircase, and beyond it a drop-arched door opening into the lodge. On the right hand is a shoulder-headed door, which leads, or did lead, into a staircase. In the front wall of the gatehouse are two corbels, which seem to have carried a small oriel, commanding the approach. Appended to the east side of the gatehouse, but entirely within the ward, is a smaller building, fitted on obliquely, as though an addition.

Entering the outer ward, the well is seen at 40 yards' distance. The buildings within the ward are modern, of various degrees of ugliness, and painfully substantial. Some are detached and harmless; others are built into the old curtain, so as to conceal and more or less injure it. The curtain, which is extremely curious, and most of it original, is best seen from the outside. Besides the gatehouse, it carries but one mural tower, — an original one, open in the gorge, in the centre of the west front.

The *gatehouse* of the inner ward is placed upon the salient and central point of the cross curtain. It is called the Captain's Tower. It is rectangular, or nearly so, about 32 ft. each way, with a projection from the curtain of 18 ft. There is one floor above the portal, which is central. The gateway is a low drop-arch, flanked by a pair of buttresses. The passage is vaulted, and has a door at each end, and at the inner end also a portcullis. Over the outside of the inner gateway is a ring of tracery, unusual, but effective. Much of this gatehouse is Decorated, but the buttresses seem Norman.

Probably there was originally a ditch in front of this wall, and gate with a drawbridge, all now gone. In later days, a small half-moon battery was thrown up about eight yards in advance of this gate, and protected by a ditch of its own. This battery was connected by a light fieldwork, which extended from it to the outer gatehouse, laid in a zigzag form, so as to cover and protect a communication between the two gates, supposing the outer ward to have been breached and entered from the north-west side. These works have been removed and the ground made level.

The cross wall of the inner ward is original, strong, and well built, and backed by a ramp of earth and masonry, containing casemates, one of which has a perpendicular doorway. These were no doubt added, perhaps by Henry VIII., to enable the wall to carry cannon. In the front of this wall, a little north of the gatehouse, is a large pointed arch of late Norman aspect, now walled up, and which may have been the original entrance.

The *keep* is rectangular, 66 ft. north and south, by 61 ft. east and west, and at present only 68 ft. high. It is very plain. There is the common high and stepped plinth, from which rise pilasters, 12 ft. broad and 1 ft. projection, two on each face, meeting at and covering each angle, which is solid. There are no intermediate pilasters. The walls do not batter, but are reduced slightly by one set-off, at a different level on each face. The window-cases, though in the original positions, are not original. The parapet has been removed, and the summit thus lowered, vaulted, and converted into a platform for guns laid *en barbette*. The south wall is 8 ft. thick, the west rather more, and the east and adjacent part of the north wall, 15 ft. The interior contains a basement and two upper floors. It is divided by the usual cross wall, laid north and south. The presumption is greatly in favour of this wall being a part of the original design; it has, however, been so much altered that it is difficult to speak positively as to its age or original height. It is at present confined to the basement; but may have been removed when, in very modern times, the upper floors were vaulted.

The original entrance was on the north face, near the centre, the cill being about 4 ft. above the floor, and 3 ft. above the outer level. This was a plain flat-sided round-headed arch. It is walled up outside, but still open within as a recess. The present entrance is at the ground level, at the north end of the east face. It has a portcullis, and is probably the work of Edward I.; but it evidently takes the place of a deep original internal recess, for from its jamb on the left, a straight stair ascends in the east wall to the south-east angle of the first floor, as at Chepstow and Ludlow. The basement has been subdivided, no doubt when the new door was opened, into four compartments, which are vaulted in stone. One is a passage against the north wall, entered by the new door, and terminating in a well-stair in the north-west angle. This stair, now disused, is original, and led to the first floor, but probably no higher. From the passage doors open on the left into two vaults, divided by the cross wall of the building. The east vault is one chamber; the west subdivided by a cross wall into two, the inner entered through the outer. The vaulting is a plain pointed barrel, very evidently an insertion. In the smaller vaults are latent stone seats. One of the doorways is of Perpendicular date. These vaults were evidently prisons, intended no doubt for the custody of Border rievers.

The first floor, about 16 ft. high, is vaulted in modern brick, and used as a mess-room. In its north side was a very large fireplace, flanked by Norman columns; but this is now walled up. This floor is now entered solely from the south-east angle, but formerly had also a door near the north-west corner, from the well-stair. There is also a door near the south-west angle, which opens into a second well-stair, which probably led to the upper floors and the battlements. This is now closed, and there is no direct way from the first to the upper floors.

The second floor is reached, at this time, by an exterior door in the west wall, approached by an exterior stair on the north face, and from the rampart on the east. This door is not original, and has been broken through at the place of a recess, probably looped, which led from the second floor into a mural chamber and garderobe in the east wall, and which are seen on the right hand of the door on entering. This second floor is about 16 ft. high, and has a timber ceiling. In the east wall, over the present entrance door, is a mural chamber, on the walls of which are some curious carvings by prisoners. One represents the Percy crescent and fetterlock, and another a coat of arms. From this floor a ladder leads through a trap into the upper floor, —a modern arrangement.

The third or upper floor is vaulted in modern brick to support the gun platform above. This platform is formed of large slabs of stone, laid down in 1812, which may also be the date of the vault. The walls above are 11 ft. thick all round.

The well of the keep is reputed to be Roman, though this is quite as likely to be true of the larger one in the outer ward. When the keep was built, the well, whether new or old, was included within the north wall, between the doorway and the north-east angle, and its pipe was carried up in the wall, no doubt with a lighted chamber at each floor, as indicated by a line of loops still seen in the wall. To make the well available when the keep was shut up as a prison, a hole was cut in the outside of the north wall, near the ground level, into the pipe of the well, and through this the water is still drawn up. The well is 78 ft. deep, and its present cill is 92 ft. above the sea level.

A curious external stair, probably Edwardian, has been built against the north face of the keep, and leads up, by the well, to the ramparts of the curtain, and so to the door of the second floor of the keep. No doubt its original use was to lead to the ramparts only.

The keep, though much disfigured to make it carry artillery, and much obscured by its conversion into prisons, a mess-room, and store-rooms, is for the most part original, and if cleared, as it should be, of the vaultings of the sea-upper floors, would be a tolerably perfect specimen of a Norman keep, with a full share of mural chambers and appendages.

The hall and other domestic buildings, including what was called Queen Mary's Tower, most of which were standing at the close of the last century, were ranged at the south-east angle, upon the adjacent walls, as shown in Grose's view. All are now gone save a fragment of panelled work, part of the shell of a grand staircase of early Edwardian date, which led to the chief apartments.

It appears that in the east wall, near its south end, and, therefore, under the midst of these apartments, was, in the last century, a Norman postern with chevron mouldings and a portcullis groove, leading from the inner ward into the field, independent of the city. These details are shown in some of the late views of the castle. Grose, in 1774, shows, obscurely, the position and size of the gateway, and the Norman pilasters by which the adjacent wall was strengthened. The upper part of this curtain seems to have been Early English. All about this angle is now modern.

The space between the keep and its adjacent curtains has been filled up with earth, kept off from the keep by a sort of area wall, and thus the ramparts here, as well as along the cross-wall, are made wide enough for cannon. The upfilling is modern, and should be cleared out.

A walk, called the "Castle Walk," or Castle Bank, has been laid out at the foot of the curtain outside, whence its details may be conveniently studied. The south-east angle, as has been said, is modern, but proceeding north and westward the old Norman part comes into view, and on the north side of the inner ward the Norman pilasters are seen rising from a plinth, but partly concealed by six enormous stepped buttresses of great projection, and Decorated or Perpendicular date, no doubt a great support to the wall and very curious, but, in a military point of view, very much in the way.

From near the centre of the north front there was a spur work, composed of a strong curtain wall, carried down the slope and ending in a round tower. This was of course intended to annoy the enemy should he attack on the west side. The whole is now removed, possibly it was an Edwardian addition. The north face of the curtain and its north-west corner have been much restored in the Decorated period, but most of

the west wall is original. Near its centre is a small tower, like the Alnwick Garnet Tower, 28 ft. broad by 18 ft. deep, and about 9 ft. projection, and open at the gorge. It is wholly Norman, of the date of the keep. It has a stepped plinth about 10 ft. high, with six sets-off of 2 in. each, and on the front face is the central pilaster, dying into the wall at the base of the original parapet. In its north face, high up, is the shoot of a garderobe flush with the face of the wall, and lower down a stone water-spout. About 10 yards south of this tower are traces of a small postern. The wall connecting the castle with the city on this side is of Norman origin, but has some buttresses apparently Edwardian, in one of which is a garderobe shoot, similar to that of the garret tower. Upon this wall, south of the ditch, is King Richard III.'s, or *Tile Tower*, 26 ft. broad, by 20 ft. deep, of no internal projection. This looks Edwardian, but probably is altered to Norman. It stands about thirty yards north of the city boundary. It is said that a few years ago a subterranean passage was discovered between the tower and the keep, and was at once closed up. This is stated in the "History of Carlisle, 1838," and should be true, but it seems improbable, for the passage must have dipped deep to pass under the wall.

The south wall of the castle is for the most part original, the Norman pilasters being seen west of the gatehouse. East of it, as far as the keep, the wall seems Edwardian, but beyond that, where it belongs to the river ward, it is Norman.

The wall between the south-east angle of the castle and the city, about 90 yards long, is mixed Norman and Edwardian, and as it crosses the ditch it makes a zigzag or shoulder, in which is a large round-headed gateway, either original or in the place of an original opening, intended, probably, to allow of cattle being driven on to the esplanade and ditch from the meads on the approach of an enemy. Probably there was a way from this gate along what is called the Lady's-walk, at the foot of the south wall, as far as the great gate. South of the postern, near what is called the City stone, are traces of a large bastion, probably a part of the city defences. The postern is now walled up, and a bank of earth raised against it behind.

The *enceinte* wall of the castle, being built against the natural slope, is outside about 28 ft. and inside 18 ft. high. It varies from 8 ft. to 10 ft. thick.

The plan of the castle—a headland converted into a detached camp by a cross-ditch—may be British or English, but the general outline of the masonry, which follows the lines of the earthworks, is Norman. The Norman engineer evidently built the *enceinte* wall along the edge of the slope, planned the inner and outer ward, and the keep. The castle is generally attributed to William Rufus, who was here in 1092, when Carlisle, from a Scottish, became an English frontier place. The see was created by Henry I., and the first bishop consecrated in 1133, when probably the city wall, of which a part may still be seen below the deanery, was built. Carlisle was taken by the Scots, and besieged by Stephen and by John. The latter most fidgety sovereign was here four times in the years 1201-6-8, and 1212. In 1204 the constable of Chester was ordered sixty marcs for fortifying the castle. In 1205 certain grass cut in the neighbourhood was to be stored there. In 1215 Robert de Ros was custos of the castle, but in 1216 Robert de Vipont seems to have been in charge of the repairs and the garrison.

In 1222 Henry III. ordered the houses within the castle to be repaired, and two balista of horn and two of wood were to be sent there. Walter Mauclerc was in charge. In 1222 the garrison was continued, and in the king's pay.

Edward I. used Carlisle in the Scottish wars, and was here to 1293, after the great fire, which much injured both city and castle in the preceding year. Between 1293 and 1307, he was here seven times, often for many days. He kept his last birthday here in 1307, and went forth hence to die in the immediate neighbourhood. To his reign are to be attributed most of the Edwardian additions, repairs of the wall and keep, the gatehouses, and the domestic building, of which only traces remain. In 1302, Bishop Hatton, then governor, expended 275*l.* 4*s.* 11*d.* in works. The Great Hall, supposed to have been then erected, needed repairs in 1344.

Camden says that Richard III. repaired the castle, and the six marvellous buttresses may be of that date, though they look earlier. Henry VIII. appeared to have much altered the castle, probably to make it carry artillery. He built the block-house or citadel at the south end of the city, and armed it with cannon, and he repaired the city walls. His work was probably done in haste; for, in 1563, the whole was in great decay, as appears from a survey made by the queen's order, printed by Grose. Three sides of the keep were in a dangerous state. The Captain's Tower wanted parapets, as did much of the inner curtain, and all the glass of the great hall and great chamber was decayed. In the outer ward was an open breach, 70 ft. long, where the wall had fallen in 1557. The result of this survey was the building a chapel and barrack, and no doubt the reparation of the wall and keep.

Mary Queen of Scots found some sort of accommodation here when she fled from Scotland, and gave name to the lodgings lately pulled down. The castle suffered somewhat during the great rebellion, but escaped being dismantled. It was battered from the west, and taken by the Duke of Cumberland in 1745.

Probably the greatest and most destructive changes are those of modern date. The hall was taken down in 1827, and the chapel and other buildings in 1835.

There are traces of two light field-works in the meads north of the castle, the smaller in the rear of the other, evidently prepared for the reception of the Scots, in 1745, as they approached over the brow at Stanwix.

The castle is far too confined and too much a part of the city for the purpose to which it is applied. The military should be removed, the modern buildings cleared away, the keep restored, and the area laid out for the pleasure of the people of Carlisle, and so as to show off the remains to the greatest advantage.

In the neighbourhood of Carlisle are other military works deserving notice. Such is, at Hayton, Castle-hill, a mound 12 ft. high, and 100 ft. diameter at the top. Linstock Castle was built before 1133, but is now little more than a farm-house, into which it was converted in 1768. Scaleby Castle was built by Robert de Tilliol, who had licence to crenellate it in 1307. It was largely repaired in 1596, but retains much of its original character, and has always been inhabited. Naworth Castle was the chief seat of the English Barony of Gillsland, at the Conquest granted to Hubert de Vaux, from whom it descended through the Dacres to the Howards. The present structure was the work of Ralph Lord Dacre in 1335, and is a good example of the quadrangular castles of that date. Rose Castle was in the Barony of Dalston, and is attributed to 1336, when Bishop Kirby had a licence to crenellate. It was also a moated quadrangle. Highhead Castle, on the Ive, is drawn by Buck. Here was a castle in 1326, but the licence is dated in 1342. The castle was rebuilt in 1714. Dalston Hall is a castellated house, probably of the middle of the fourteenth century.

The Roman wall may be traced at various points, both east and west of the passage of the Eden. It is well seen in a field close to Drawdykes, a stiff, square farmhouse, built on the site of a Roman Castellum, and possibly of a later period. The inscription "Diis Manibus," built into its walls, is said to have been dug up in Carlisle, near the old citadel. G. T. C.

THE LONDON AND WESTMINSTER BANK BUILDINGS, TEMPLE BAR.

DURING the last few months the Temple Bar Buildings of the London and Westminster Banking Company have been undergoing extensive alterations and improvements, both externally and internally, from designs furnished by Mr. Edward Barry, R.A. The works, which have been carried forward under circumstances of considerable difficulty, especially those in the interior of the building, are now nearly completed, and whilst the architectural ornamentation of the structure externally has given to it a striking appearance, and rendered it a prominent feature amongst the buildings adjacent to it in this part of the Strand, the extension and re-arrangement of the banking-house within have given greatly-increased facilities for carrying on the business of the bank itself.

The former unpretending brick elevation to the Strand has been replaced by a new frontage in Portland stone, which is carried up to the first-floor windows. The old entrance to the bank in the centre of the elevation has been removed, and in its place an additional window has been substituted. A new entrance has been erected at the east angle. This entrance consists of a handsome porch, brought forward several feet beyond the main body of the elevation of the building, and extending to the Strand footway. On each side of the porch entrance there are rusticated piers, from which springs an arched headway moulded, in the centre of which is a large carved key-stone, representing a colossal figure-head, and over this is the word "bank" in stone letters, intertwined with carved ornamental foliage. The porch entrance has a vaulted ceiling, divided into three compartments, which are surrounded with carved mouldings, composed of fruit and flowers. The return frontage on the west side of the porch to the main elevation, as well as the elevation itself, is uniform with the front of the porch, rusticated piers being carried up between each window, which have arched headings with covered key-stones, representing large figureheads, similar to that over the entrance. The porch and window-heads are all enriched with carving. The west side elevation of the porch is surmounted by a carved panel containing the bank monogram supported by cornucopias containing symbols of trade and the various sources of wealth, whilst above this again there are a cornice and five small ornamental panels. The carving was executed by Messrs. Mabey, of Storey's-gate, Westminster.

The banking-room has been increased to double its former size, and now contains an area of about 2,200 superficial feet, being 28 ft. in width by 85 ft. in depth from the Strand frontage. This greatly-increased space has been obtained by utilising what was formerly an open courtyard at the rear of the building, and by also taking in a portion of the old strong-rooms. The banking-house, so enlarged, at the rear, is lighted by lantern light, which also ventilates the apartment.

The new strong-rooms which have been constructed in the basement of the building have been one of the heaviest portions of the work, and also that which has been attended with the greatest difficulty. It has already been stated that formerly these were on each side of an open courtyard, but that along with the latter they have now been added to the banking-house. The former strong-rooms were constructed of brick with vaulted ceilings, but the new apartments for this purpose, which have just been erected in the basement of the building, have been constructed upon an entirely different principle so as not only to be fire-proof, but also burglar-proof. Before proceeding with the construction of these strong-rooms the drainage under the building was re-arranged, the drains being lowered 2 ft. 6 in. below the foundation, and in order to effect this the walls of the building had to be underpinned. In carrying out this portion of the work the drains were diverted in order that none of them should pass immediately under the floor of the strong-rooms, the object being effectually to prevent damp. This suite of rooms contains an area of 1,200 superficial feet. The floors are 2 ft. 9 in. in thickness, and are composed of brick inverts, upon which rests a layer of Portland cement concrete. Resting upon this again is another layer of asphalte 1 in. in thickness, the more effectually to prevent the books and documents of the bank from being affected by damp. The surface of the floor is then laid with 4-inch York stone. The walls and ceilings are composed of hard brick and Portland cement, the outer surface being faced with wrought-iron plates ¼ in. in thickness, the entire thickness of the walls being nearly 2 ft. The roof is vaulted in hard brick, the spandrels being filled in with Portland concrete cement. The entrances to the different strong-rooms are fitted with Chubb's iron doors and locks, with external doors, together with outer grilled gates in addition. There is a powerful hydraulic lift communicating with the banking-room above, for the purpose of carrying the books and bullion of the bank to and from the strong-rooms. This lift is capable of carrying several tons weight if necessary. It was supplied by Messrs. Owens & Co., of Whitefriars.

The whole of the works have been executed by Messrs. Cubitt & Co., of Gray's-inn-road, under the superintendence of Mr. Cook, as clerk of works, and Mr. Rowe, as foreman for the contractors.

It may be mentioned that the building is associated with several recollections of historical interest, as being one of the oldest banking-houses in London, and second only in age to that of the

Messrs. Childs. It is said originally to have been in the occupation of Messrs. Snow & Walton, who, during the period of the Commonwealth, carried on business there as pawnbrokers, under the sign of the "Golden Anchor." This firm suspended payment about 1672, as did also several banks, owing, as was said, to the tyranny of Charles II. The occupation of the bank by Messrs. Strahan, Paul, & Bates in more recent times, is identified with contemporary history.

ARCHITECTURE AT THE ROYAL SCOTTISH ACADEMY.

ONLY one side of the small dimly-lighted octagon, to which the architectural drawings are relegated, is occupied by them. As a whole they are far from being attractive to the general public; none of them are got up in brilliant colours; and supreme efforts at unattainable grandeur of effect are not attempted. Neither are there any of the wild attempts at originality which appeared last year, but generally the designs are appropriate and are characterised by repose and refinement of treatment. None of them are remarkable as regards subject (the buildings illustrated being comparatively small and unimportant), with the exception of the "Interior View of the Catholic Apostolic Church, drawn by Mr. A. H. Haig, now building at East London-street, Edinburgh,"—Robert Anderson. This church was the subject of a limited competition. Last year Mr. Anderson exhibited a Gothic version of the interior, but as the instructions to the competitors were to the effect that the style was to be Norman, it must have been only an alternative suggestion. Stately and graceful as that interior was, that which has been decided upon will be even more remarkable and uncommon. A wise discrimination has been displayed in eschewing the use of zig-zag mouldings, cushioned caps, &c., and fixing upon the last phase of the style as used in France just before the introduction of the Gothic style, although none of the openings are pointed. The baldacchino, canopied throne, and pulpit have a Lombardic leaning, and their light richness acts as a foil to the massive simplicity of the general design. The church consists of a spacious nave, without aisles, lighted by plain, deeply-recessed windows high up in the walls, in the thickness of which a triforium passage is shown. The chancel, which terminates in an apse, is of unusual size; it is flanked by aisles of two bays; and shafts, statuary, &c., are used in the clear-story, the richness of effect increasing as the eyes travel eastward. The drawing is a work of art far superior to most of the paintings in its immediate vicinity; and had it not appeared amongst the architectural drawings, it might have been mistaken for a view of an existing ancient edifice.

Mr. William Leiper is largely possessed of the inventive faculty; he never repeats himself, and his designs exhibit careful study and chastened taste. "Bank-street United Presbyterian Church, Brechin," is a small, sober, unpretentious edifice. The architect has not, as is too often done, overstrained the means at his command, and attempted to make much out of little. "Proposed New Established Church, Glasgow," has a gracefully-proportioned spire skilfully united to the body of the church, which is simple and effective both in outline and detail. "Design submitted in Competition for Church, Glasgow," of which there are both exterior and interior views, seems to be founded upon the Santa Chapelle in Paris. There are very low aisles, used only as passages, carried along the sides and round the apsidal east end; the whole light is derived from the large windows of the clear-story, and the roof is vaulted. If adopted, it would have been an appropriate and dignified edifice. If "Free St. Enoch's Church, Glasgow,"—Campbell, Douglas, & Sellar,—is the successful design, we have another example of the manner in which committees are swayed in their choice. The body of the church is starved, poor, and commonplace, the whole effect being concentrated in a tower terminated by an open crown taken from that of St. Nicholas, at Newcastle.

"Evangelical Union Church now being erected in West Cross Causeway" (Edinburgh),—R. Thornton Shiells,—is a badly-drawn perspective of a very poor design. The site of the church is a circumscribed one, jammed in between tall houses in a narrow thoroughfare. The vestries and other accessories are placed on the ground-level, above which is the church (with galleries) which is reached by two flights of stairs. This arrangement is good in the circumstances, inasmuch as height is given to the elevation, preventing it being swamped by the surroundings; but the raking windows of the stairs are poorly managed, and the general aspect is anything but ecclesiastical.

To design a Gothic church with galleries is a problem to which Mr. John Russell Walker has set himself, and he has done so in a satisfactory manner so far as the exterior is concerned.

There are several other designs for churches, all of them extremely commonplace. A "Suggestion for an Altar-piece," by Arthur Clyne, is an artistic production possessing considerable breadth of treatment. The detail is carefully and not lavishly applied, and the general effect dignified and appropriate.

The "New Buildings for the Scottish Amicable Life Assurance Society, St. Vincent-place, Glasgow,"—Campbell, Douglas, & Sellar,—are Italian Renaissance in style, the semicircular-headed arch being used throughout. The building is a handsome one, and is conscientiously carried out without any attempt at originality of treatment.

"Cargen House," and "Treave House, Kirkcudbrightshire," are two compact, comfortable-looking mansions, in which Messrs. Peddie & Kinnear have given to the Scottish Baronial style a modern aspect, without detracting from its picturesqueness.

"The Mansion House of Glenapp, Ayrshire," is one of those stately châteaux so many of which it has fallen to the lot of Mr. David Bryce to design, and it bears a strong family resemblance to some of its kin.

The "Mansion House erecting in the Queensferry-road, Edinburgh," displays some of the peculiarities which characterise the designs of Mr. Frederick Thomas Pilkington, with somewhat of an Italian leaning, and less effort at picturesqueness of effect.

"Sketch Design for a Block of Mansions, Mayfair, London, 1868,"—William Scott Morton,—if carried out would certainly have been a marked feature in the Domestic street-architecture of the West-end. Lanky turrets, high-pitched gables, and pointed roofs form conspicuous features in the elevation.

"Designs for Improvements on Married Soldiers' Quarters, Edinburgh,"—R. Moreham, jun.,—shows how an ugly, deformed row of buildings may be converted into a picturesque and interesting group. We hope that the alterations which are being carried out will be as good as this, but we have doubts on the subject, considering the quarter from which they emanate.

MICHELANGELO BUONAROTI.

IN a paragraph of the *Builder*, p. 129, it is announced that the four-hundredth anniversary of the birth of Michelangelo will be celebrated in Florence, and the committee for carrying out the arrangements were seeking assistance. Such being the case, it may not be out of place at the present time to glance briefly at the works of one who is known, by name at least, to the veriest tyro in art. His first attempt in oil-painting was a representation of the Temptations of St. Anthony, and the effort drew praise even from Ghirlandaio, who was jealous of his young pupil. About this time Lorenzo de Medici, better known as the Magnificent, resolved to set up a school of sculpture in Florence, and to that end made a garden which he supplied with antique statues and busts. This garden was free of entrance to all Florentine students of art. The sight of the works which adorned it so wrought upon his mind that he resolved to renounce painting, and devote himself to sculpture. Lorenzo was so pleased with the work of his garden-visitor, that he made him an inmate of his house during the remainder of his life. Lorenzo died in 1492, and his brother Piero, who succeeded him, treated the artist in a different spirit. Of the prince's insulting command thus writes Mrs. Browning:—

> "I do believe, divinest Angelo,
> That winter hour in Via Larga, when
> Thou wert commanded to build up in snow,
> Some marvel of thine art, which straight again
> Dissolved beneath the sun's Italian glow,
> While thine eyes still burnt, with the plastic passion,
> Thaw'd, too, in drops of wounded manhood, . . . since
> Mocking alike thine art and indignation,
> Laugh'd at the palace window the new prince."

But the laughter was not for long. Angelo exiled himself to Bologna, where he contributed two statues to the church of the Dominicans, and in a year after returned to Florence. His statue of a Sleeping Cupid, which he had executed in the meantime, so attracted the attention of Cardinal Giorgio, that he was by him invited to Rome. During his residence in Rome he devoted his entire time to the study of sculpture. From Rome he was recalled to Florence to assist in carrying out several important art-works projected by the Government of the latter city. Among these was the completion of a gigantic statue of David, which was left uncompleted by Simon da Fiesole, who found the task beyond his powers. During this visit to Florence his pencil also came into play; as a companion cartoon to one executed by Leonardo da Vinci, for the hall of the ducal palace, he produced his cartoon representing an episode in the wars of Pisa. Of this grand work nothing remains but a few dismembered fragments, yet while it existed in its entirety it was the study of artists from all countries. Angelo had not entered on his thirtieth year when he was again recalled to Rome by Pope Julius II., and by him commissioned to make his monument. Every monument under certain conditions requires a shrine. Angelo looked round Rome, and saw no fitting depository for his work when finished; the then existing St. Peter's was an old church not at all adapted for so superb a mausoleum, and, therefore, he proposed the erection of a new St. Peter's, and this he began by substituting for the Saracenic design of San Gallo, the architect at first employed by Pope Julius, a more Christian and becoming model in the shape of a Greek cross. Fuseli, speaking of Angelo's design, says, "This fabric scattered into infinity of jarring parts by his predecessors, he concentrated; suspended the cupola, and to the most complex gave the air of the most simple of edifices." To the completion of St. Peter's, which he never saw completed, he devoted the remainder of his life; but yet during the time he could find hours of leisure, which he spent in adorning the Capitol with magnificent buildings, finishing the Farnese Palace, furnishing many architectural designs, and directing the construction of the fortifications of the Eternal City and of Florence, the chief town of his own Tuscany. The latter years of his life were embittered by circumstances connected with the building of St. Peter's. It was requisite, among the many men employed in the undertaking, to dismiss some and promote others, and on this account he was beset by cabals and harassed by opposition, and even combinations were organised to oust him from his office, but on all occasions he met with the support of the Pontiffs. He died on the 17th of February, 1563, and his last words were,—"Remember in your passage through this life the sufferings of Jesus Christ." The committee in charge of the celebration is desirous of making up a catalogue of all his works, as an architect, a painter, and a designer. These works, it may be said, are spread over the civilised world. Rome and Florence contain many; Munich, Dresden, Berlin, Paris, and the public and private galleries of England are the happy possessors of others. What amount of art-work he did no one knows. A slight hint as to its multifariousness may be gleaned from the headings of some of the chapters of one of his biographies,—"Finishes a Basso-relievo of the Battle of Hercules with the Centaurs"; "Completes a Statue of Bacchus now in the Florentine Gallery, La Pieta in St. Peter's, and other works"; "Paints a Holy Family for Angelo Doni"; "Is employed to make a grand Mausoleum for the Pope"; "Makes a Bronze Statue of the Pope"; "Paints the Ceiling and Walls of the Sistine Chapel"; "Builds a Library and new Sacristy to the Church of St. Lorenzo, also two Monuments for the Dukes Giuliano and Lorenzo"; "Is appointed Military Architect and Master of Ordnance to the Republic"; "Paints the Last Judgment in the Sistine Chapel"; "Is appointed Architect to St. Peter's,—accepts the Appointment on the express Condition of receiving no Salary," &c. These are but a tithe of what he accomplished. Considered either in relation to the degree or the variety of his talents, the man to whose memory Florence is to do honour in the March of the coming year holds a foremost place among the great men of an age which has left the most durable impressions upon the arts and literature of Europe. As a painter and sculptor he created his own style, which, by its originality, has remained unapproachable either by rivalry or imitation. As an architect he con-

verted the incongruous structure of St. Peter's into the grandest temple ever designed for the worship of the Eternal. As a painter, despite his proclivities towards sculpture, his reputation is, perhaps, more permanently based on his paintings in the Sistine Chapel. As a poet he was great, but not among the greatest. To apply the opening of one of his sonnets to himself—

> "How shall we speak of him, for our blind eyes
> Are all unequal to his dazzling rays?"

Michelangelo was one of the few great men who have been honoured in their own country and generation. The writer of the above has before him many letters (the ink has faded, but the characters are legible) written to, or answered by, Michelangelo. In one of these he is addressed by Benvenuto Cellini as "*Eccellentissimo e divino precettore mio Messer Michelagniolo.*" ("To my most excellent and divine preceptor, Master Michelagniolo") — and the great master Cellini meant not this for flattery.

It seems strange that the 400th anniversary of the birthday of Buonaroti should be celebrated in 1875, seeing that he was born in 1474. Of this there cannot be the slightest doubt, Ascanio Condivi, his intimate friend, who wrote and published "Vita di Michelagnolo Buonaroti," ten years previously to the death of the great sculptor, painter, and architect, says, "This same Podesta of Chiusi and of Caprese nel Casentino, found himself the father of this little boy (Michelangelo), on the 6th day of March, on a Monday, at four in the morning, in the year of our salvation, 1474."

MARSHAL MAC-MAHON ON PUBLIC WORKS IN PARIS.

THE speech of the President of the Republic at the Paris Tribunal of Commerce was something more than a mere rhetorical declaration of abstract principles. It promised definitely a rapid revival of the building interest in Paris, and consequently a renewal of activity in all the vast correlative branches of industry. The indication of such a perspective was the surest way of demonstrating the stability of the Government. The work commenced by Baron Haussmann is to be completed. The large population of builders, masons, stone-cutters, &c., allured to Paris by the famous imperial prefect, will again be conciliated by the 6 francs per day of the Cæsarian epoch. Not only has this population contributed during the last four years 25 per cent. to the indigent classes of Paris, but the State itself has suffered in a somewhat similar proportion. In 1869 the tax on the measurement of stones for building yielded more than 900,000 francs per annum. Last year the receipts did not amount to 200,000 francs! The eloquence of these figures has convinced the President of the Republic that an immediate resumption of public works in Paris is necessary, not only to save Parisian industry from utter stagnation, but to preserve the present Government from hopeless collapse.

A summary description of the works proceeding, or about to be undertaken, may give some idea of the magnitude of the Presidential programme. Several important changes are to be effected in the buildings of the Hôtel Dieu. The hospital has never yet been completed, and already alterations are judged necessary by a committee of medical authorities and municipal councilmen. The hospital is situated in the island of La Cité. Its ventilation has been condemned; a considerable portion of the internal walls are to be levelled, and the number of beds reduced from 800 to 450. It is estimated that these alterations cannot be completed before the end of next year. The second great work announced is the construction of a bridge across the Seine, which, starting from the axis of the Boulevard Saint Germain, shall cross the island of Saint Louis, and abut on the opposite Quais des Celestins. Across the point and narrower arm of the river the bridge will be composed of one cast-iron arch of 66 mètres span; at the larger arm it will number three arches of 44 mètres in width each. The bridge will rest on free-stone abutments. The contracts for the different portions of the work have just been advertised. The cost is estimated at 2,840,000 francs, of which the State will contribute 1,390,000 francs. The works will be commenced early in May. Two railway stations are to be constructed; one at Grenelle and another at the Glacière-Gentilly. Moreover, the President of the Republic has announced that a new circular railway is in course of projection.

Another decision arrived at in the interest of the building trade is that which has just been taken with regard to the state lands in Paris. These lands are the sites of buildings destroyed by the Commune: the Ministry of Finances, the Palais d'Orsay, the Luxembourg, and the Grenier d'Abondance. They are to be disposed of to contractors at an early date, and in order to fulfil some of the Presidential promises, a clause will be inserted in the contracts which shall compel the possessor to build immediately. A credit of 700,000 francs has been obtained with some difficulty from the Committee of the Budget for the completion of that wing of the Tuileries known as the Pavillon Marsan. This and the Pavillon de Flore are the only portions of the ancient palace that can be preserved. The capital question for most Frenchmen is that of the new forts. The works necessitated by the decisions of the Committee of Fortifications will be commenced on the 1st of March. The new armed circle will attain a minimum of 170 kilomètres. The present circle of forts will be retained as a second line. The outer circle will be composed of smaller forts, constructed according to the polygonal system recently modified by a colonel of engineers. They will shelter 800 men at most, and be protected by iron-clad turrets. These new constructions are twenty in number, and will be situated at a distance of from nine to ten kilomètres from the old *enceinte*.

M. Alphand, the well-known Director of Public Works of Paris, will have the general supervision of nearly all these undertakings. The chief architects employed are MM. Diet, Duc, and Daumet.

THE SOUTHWARK AND VAUXHALL WATER COMPANY'S NEW WORKS AT NUNHEAD.

FOR more than two years past new works of great magnitude have been in course of construction for the Southwark and Vauxhall Waterworks Company. They include four immense reservoirs situated on the high ground at Nunhead, together with a spacious engine-house, containing powerful direct-acting engines, and four boilers, each 30 ft. in length, by 6 ft. in diameter. The engines and boilers are being supplied by Messrs. Harvey & Co., of Hayle, in Cornwall. The works also embrace the laying of no less than fifteen miles of main pipes, 3 ft. in diameter, in order to connect the new reservoirs at Nunhead with the company's intake on the banks of the Thames, near Teddington Lock. These mains have been laid by Messrs. Aird & Son, of Belvedere-road, Lambeth, who have also executed some of the heaviest portions of the work in connexion with the construction of the reservoirs. The new mains from the neighbourhood of the company's intake, are carried under and along several main thoroughfares in a north-easterly direction, and after being carried for a considerable distance through the Wandsworth and Clapham roads, are thence continued along Acre-lane, crossing Brixton-road, into Coldharbour-lane, passing along its entire length to Camberwell, at the foot of Denmark-hill, just above High-street.

We have already stated that the reservoirs are four in number, and it may be added that, together with the engine-house and other buildings, they cover an area of upwards of 14 acres. They are constructed on different levels, two on the high level and two on the low level. The high level reservoirs are four acres in extent, with a storage capacity of six million gallons of water; whilst the area covered by the low level reservoirs is double that of the others, namely, eight acres, and equal to a storage of twelve million gallons, the aggregate capacity of the four reservoirs being eighteen million gallons, thus giving some conception of their enormous extent. The engine-house and other buildings, noticed below, have been erected on a plot of ground situated between the higher and lower reservoirs. The extreme depth of each reservoir is 20 ft., and the floors are made perfectly watertight by a surface of concrete and puddle 12 in. in thickness. The embankments of the reservoirs are built in terraces, each 16 ft. wide, with a slope between each equal to the width of two. They are faced and made dry with red ballast, and drained with pipes. All the reservoirs are firmly covered in, with the view of securing the water from the action of the weather and atmospheric impurities, and on the outer surface above a turf will be laid down, which will answer the double purpose of still farther promoting the purity of the water, and also rendering the area above capable of being utilised for grazing purposes, or ornamentally laid out. The coverings or roofings are supported by brick arches springing from piers, the space above and between the arches being filled in with puddle and soil. Each reservoir has one inlet, together with an overflow pipe of 30 in. in diameter, and in the construction of the works a system of valves has been introduced, which will admit of the whole of the reservoirs being quickly run dry, even should they be fully charged with water. The good quality of the water is further provided for by gravel and sand filtering-beds, through which the water will pass in its course from the inlet to Nunhead.

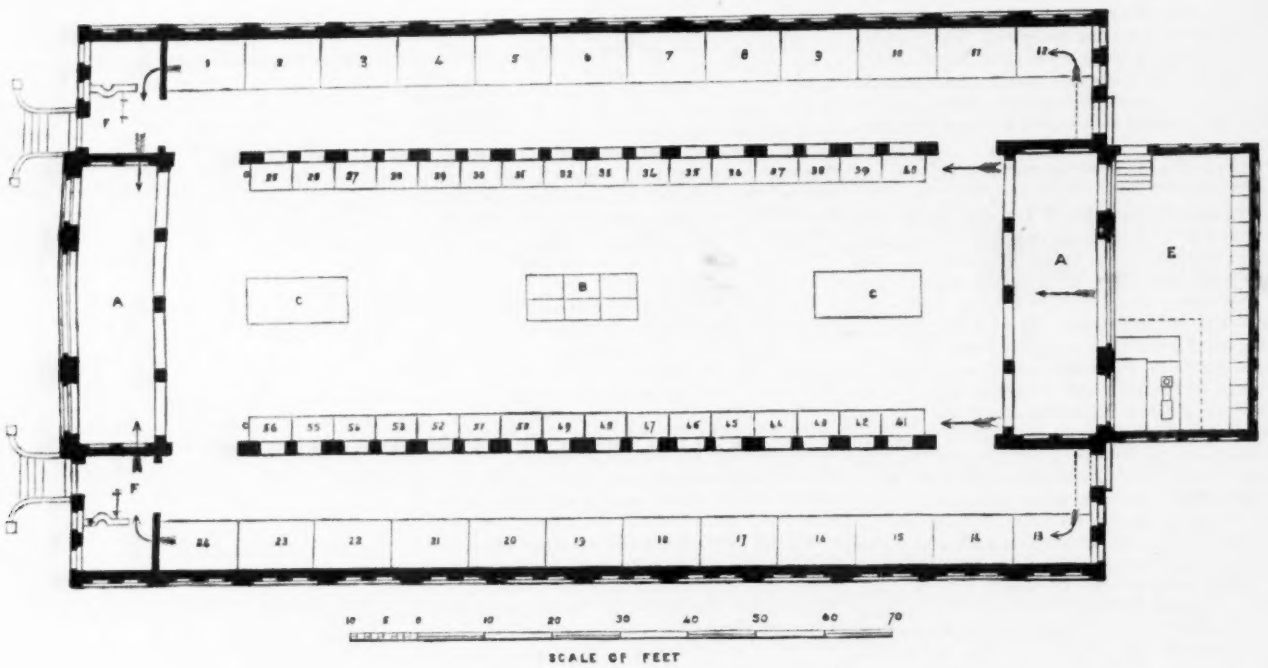
The engine-house, situated between the lower and the higher reservoirs, is already built. It has a water-tower, 70 ft. in height, prominent for several miles around. The materials used in the structure are white Suffolk brick, with stone and red brick dressings. Almost immediately adjoining the engine-house is the manager's residence.

The whole of the works are now fast approaching completion, and it is confidently expected that all will be in readiness for commencing the supply in the course of the ensuing summer. The laying of the great mains, already referred to, which has been a heavy portion of the undertaking, has just been completed, and the reservoirs themselves are now almost finished; whilst the boilers have also been fixed in the engine-house, and the engines themselves are expected to arrive in the course of a few weeks. The estimated cost of the works, exclusive of the value of the land, is about 220,000*l*.

The works were designed by Mr. Just, C.E., in conjunction with Messrs. Joseph Quick & Son, who have carried out the undertaking, assisted by Messrs. Aird & Son, as contractors for the building portion of the work.

MOUNT SINAI.

FORTY years ago Dr. Beke published a small pamphlet which was devoted to the consideration of the particular localities of Horeb, Mount Sinai, and Midian. The two former places, so memorable in the history of God's chosen people, are usually considered to be situated within the peninsula formed at the head of the Arabian Gulf, or Red Sea of modern geographers, by the two gulfs of Suez and Akaba. According to the hypothesis of Dr. Beke, the gulf of Akaba is to be regarded as the Yam Suph, or Red Sea of Scripture, and consequently the sites of Horeb and Mount Sinai must necessarily be placed eastwards of that sea. In support of his hypothesis, Dr. Beke, although beyond the allotted "threescore years and ten," has this year, through the kindness of the Khedive, been enabled to explore the country eastward from the gulf of Akaba, and the telegraph briefly reports that he is confident in having discovered the true Mount Sinai, which is known to the Arabs as Jebel-el-Hur, or the mountain of light, which, even at the present time, is held in such high veneration that, whenever an Arab comes in sight of the mountain, he kneels down and prays with his face towards it. So far Dr. Beke; but Lepsius, and he is supported in his theory by Burckhardt, finds Mount Sinai in Jebel Serbâl. Serbâl is the most magnificent mountain of the peninsula. The earliest traditions are in its favour,—its identity is asserted by Eusebius and Jerome. A second theory is that of Ritter, the geographer, who credits Serbâl with the reverence of an early sanctuary, but claims that Jebel Mûsa is Sinai, and that the wady or valley which its highest summit overhangs is the camping spot of the Israelites. There is one objection which applies equally to Jebel Serbâl and Jebel Mûsa, namely, insufficiency of ground at their bases to accommodate the multitudinous wanderers. Upwards of twenty years ago Robinson advanced his theory that the modern Horeb of the monks, the lower face of the Jebel Mûsa, crowned with a range of magnificent cliffs, the highest point of which is called Ras Sasafeh, is the scene of the giving of the Law, and the mountain peak into which Moses ascended. The matter, as yet, is one of mere conjecture. Should Dr. Beke have succeeded in finding a mountain and a valley which meet all the requirements of the local description in Holy Writ, he will deserve the thanks of all who take an interest in the important subject of Biblical Topography.



Nos. 1 to 24. Deep-sea Tanks; and Nos. 25 to 56, Tidal Tanks. Reserve Cisterns under.
A. A. Ocean Tanks. B. Table Aquaria. C. C. Fresh-water Tanks. E. Engine-house and Reserve Tanks. F. F. Offices and Entrances.

THE MANCHESTER AQUARIUM.—*Ground Plan.*

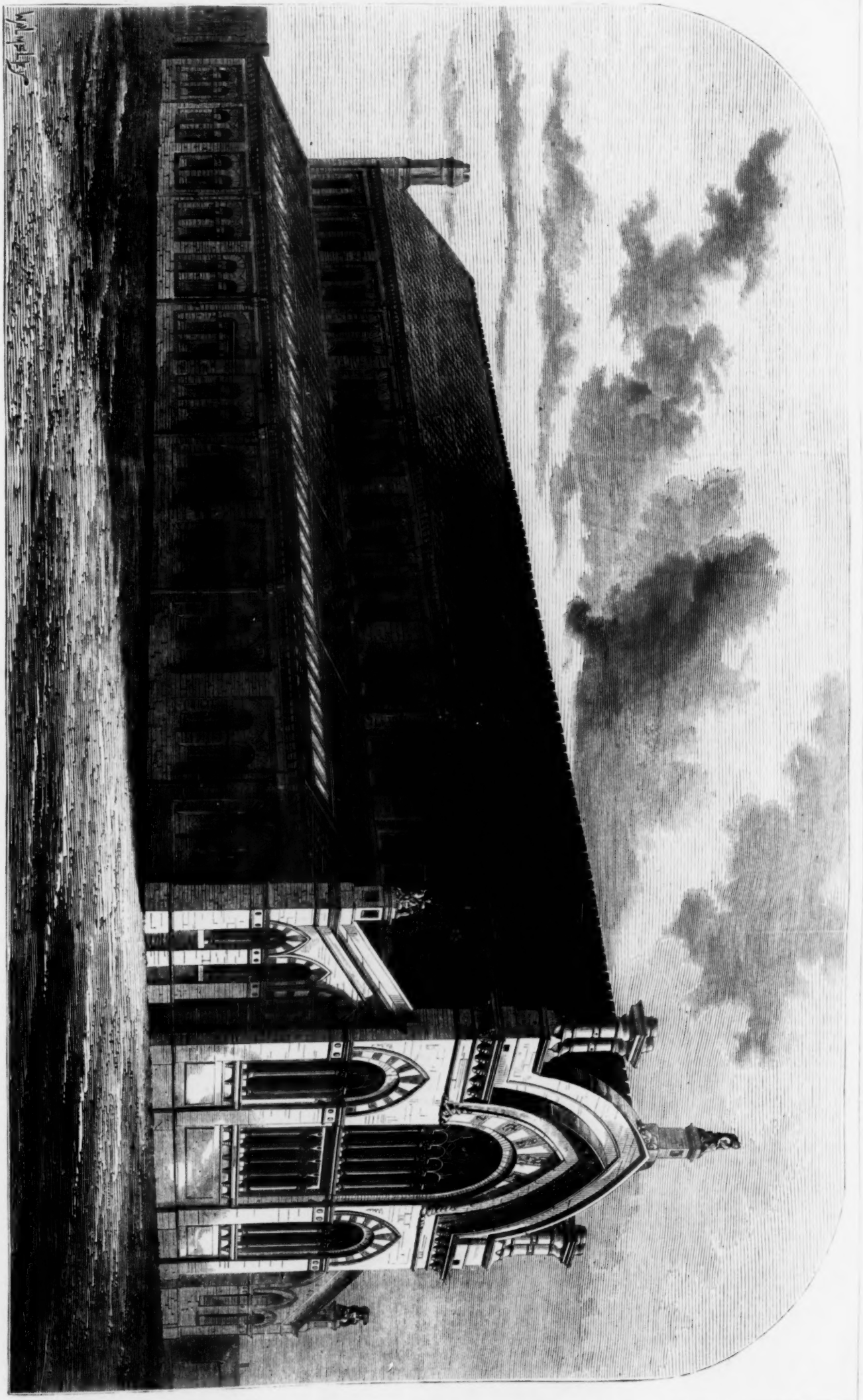
THE MANCHESTER AQUARIUM.

The Manchester aquarium, which is just on the eve of completion, though widely different in character of structure from its now celebrated predecessors at Brighton and Sydenham, combines much that is excellent in both of these exhibitions. No more admirable site in an inland town could have been selected for its erection. Alexandra Park, of which it forms the chief and most important feature, fronting its beautiful lawn, is one of the most delightful retreats in the west-end portion of the busy city of Manchester and the borough of Salford. It is easy of approach, omnibuses running constantly at low fares from the centre of the city.

Our first impression, as it sprang fully into view, when we crossed the park to the chief entrance, was its ecclesiastical appearance; it might be mistaken for a gigantic temple, erected for some popular preacher. Its Italian-Gothic frontage, with rows of clearstory windows, and roofs at side, somewhat confirmed these impressions; but on entering its interior they were quickly dispelled. The building extends 174 ft. in length. It is built with white Ruabon brick, enriched with red Runcorn stone dressings, carved in various designs and figures. The roof is of Taylor's patent red and black tiles, formed into a pattern, which renders the building a conspicuous object throughout the surrounding district. But these tiles perform a more important office. They are nonconductors of heat. "I was in this building," the curator told us, "the hottest day we had last summer, when the thermometer stood in the shade more than 100 deg., and it was then full of workmen. All were broiling outside, but here it was as cool as a spring evening."

Passing through the lobby we enter the north corridor: it is nearly a repetition of that at the Crystal Palace,—a long row of glass-fronted tanks on the right-hand side, and a row of arches or bays on the left. These tanks are very capacious, eleven of them measuring 10 ft. 6 in. by 5 ft. 6 in. in depth, and from front to back, 6 ft.; the central tank of the row being 21 ft. long. Doubtless the experience gained both at Brighton and Sydenham was a valuable aid in the designing of these tanks, and also those of the south corridor, which is similar. They are a medium of their prototypes, avoiding the gigantic size of the first-named, and the general miniature size of the second. These twenty-two receptacles which Mr. Hooper, the curator, properly names the deep-sea tanks, are those in which it is proposed to keep the numerous tribes of the familiar and well-known forms of marine life that are captured in British waters. From each extremity of these corridors, which run the full length of the building, we enter its central and principal portion, a saloon or hall of large size being 150 ft. long., 40 ft. wide, and 54 ft. to the roof principals. Down each side of this hall, beneath the arches which divide it from the corridors, are placed the tidal tanks, of which more presently. Perhaps one of the most pleasing features is the arrangement and decoration of these arches. It is absolutely necessary that little or no light should pass through them to the transparent fronts of the corridor tanks, therefore it is intercepted by filling these spaces with growing evergreen ornamental plants, placing them on black marble sills, supported by carved bracket-heads, which form fountains for the tidal tanks below them. Again, above these arches are the clearstory windows reaching to the cornice of the open-panelled roof of polished pitch pine, supported by eleven principals of the same timber. Beyond this and its tanks there is no attempt at decoration whatever; all is plain and simple, and well adapted for the purpose for which it is intended. At each end of this hall we detect a copy of some portion of the Brighton aquarium, in two of the largest tanks, 40 ft. by 10 ft., with a depth of water of about 8 ft. It is easy to perceive the care with which these tanks have been designed. Possessing a transparent frontage similar to the largest of the Brighton tanks, and fully equal to them in extent, the serious error of a great breadth of from 30 ft. to 40 ft., from back to front, which renders the most pellucid waters semi-opaque, is avoided; these are only 10 ft., and the rays of light, in addition to entering at the surface of the water, and passing through it to the spectator, enter also through three apparently submarine caverns at the back. These are formed by encasing 4 ft. of the lower portion of the east and west end large windows with strong plate-glass, built in the rock-work. The east-end tank is the receptacle for the full body of water, about 5,000 gallons per hour, drawn from the reserve-cisterns, which extend to a depth of 6 ft. below the entire series of exhibition tanks. It enters this tank from an elevation of 14 ft., forming a thin sheet or cascade of water 13 ft. wide, falling on a ridge of rocks, dashing its spray in all directions, and then, by two overflows, to the right and left, passes to the corridor tanks, and, finally, enters the west tank, and returns to the range of cisterns below. Independently of this regular circulation of the water through every tank, other means are adopted for its perfect aëration. A portion, as it leaves the pumps, is diverted, and driven through rows of pipes placed above the corridor and tidal tanks, and passes through fine roses or jets, in the form of rain, to the surface of the water in each tank; this, independently of oxygenating the water, has a pleasing effect, the minute globules of water descending to a great depth again rise to the surface like effervescent bubbles of quicksilver, sparkling and giving it a lifelike appearance. Every visitor to the Crystal Palace aquarium will remember the shallow tanks in the side rooms stocked with our lovely sea anemones and other littoral forms of marine life. Very similar are the tidal tanks of the Manchester aquarium. They are constructed of polished black enamelled Welsh slate in two rows of sixteen compartments, 6 ft. long by 3 ft. in width, with a uniform depth of water of 12 in. The animals which these tanks will contain are seen not only through glass frontage, but in precisely the same way as the contents of the glass cases in our museums are. By simply opening a valve the water can be drawn from these tanks and returned to them either in a few minutes or hours, forming a perfect ebb and flow of the tides, and exposing the creatures they contain to the alternate action of exposure to the atmosphere and submersion of the tidal wave. We must not omit the arrangements for the preservation and exhibition of the denizens of our lakes, ponds, and rivers, and those animals that require to be kept in still water.* The large fresh-water tank occupies the cental portion of the hall or saloon, and is 16 ft. by 6 ft., 2 ft. 6 in. deep, divided by plate-glass into six sections; at each of the centre angles of these divisions is a crystal fountain, causing a constant fresh supply and flow of the water, by which means it is hoped the most delicate of fresh-water fish may be kept for an indefinite period in full health and vigour. At a short distance from each end of this tank are twenty smaller ones, known as table aquaria, which will be appropriated for the purpose we have named. In addition to the public tanks in the aquarium proper, provision has been made for twelve large store-tanks at

* The total tank frontage is 750 lineal feet.



THE MANCHESTER AQUARIUM.

present in use in the company's temporary building, for the purpose of acclimatising marine animals after their reception from the different parts of the coasts.

Upwards of 200,000 gallons of pure sea-water will be required to maintain the whole series of tanks in full working condition, two-thirds of which will be constantly flowing from and into the reserve subterranean cisterns.

So successful has been the mode adopted by Mr. Lloyd at the Crystal Palace Aquarium of circulating the waters, and its general management, that there has been seen no reason to deviate from it in any of its important features.

In this aquarium provision has been made for such accidents as breaking of glass, leakage of water, failure of a pump, and other contingencies; so that in no event, it is thought, will they for one moment interfere or disorganise the general arrangement.

The building has been erected under the personal superintendence of Mr. B. Hooper, the curator, assisted by Mr. M. Seanor, architect, of Manchester. The contractors, Messrs. James Herd and William Healey & Sons, Cordingly and Stafford, have satisfactorily performed their part. The slate and ornamental tanks were supplied by Mr. John Robertson, of 48, Market-street; the gas and other fittings by Messrs. Lloyd & Bridge; and the plate-glass was supplied by Messrs. Winder & Horrop.

ARCHITECTS AND THEIR LIABILITIES.

AFTER a protracted hearing, a case was finished on Saturday, in the Court of Exchequer, which is of great interest to architects and builders. The case referred to is that of Timms *v.* Kerr. The plaintiff, Mrs. Timms, employed Professor Kerr to superintend certain alterations in two houses, situate in Jermyn-street, which belonged to her, and she contended that he omitted to bring proper skill to the work; alleging, in fact, that he had been guilty of negligence in the performance of his duty. In consequence of this, she complained that she had sustained damages, and the action was brought to obtain compensation. Professor Kerr, as she wanted to throw her two houses into one, agreed to undertake the work at 5 per cent., in addition to remuneration for the drawings, the total cost she intended to spend not being more than from 500*l.* to 600*l.* The work being commenced, was carried out very slowly, and she lost lodgers, her business being that of lodging-house keeper. In the course of evidence given, Mr. White, the builder employed, said that he submitted an estimate for 1,616*l.*, which was not accepted, but ultimately he commenced the work upon a new set of plans. A chimney was built, which caused Mr. Daniel's (adjoining) wall to give way, for which Mr. Daniel brought an action, and got 100*l.* damages. Mr. Cremer, surveyor, gave evidence to the effect, that the old wall ought to have been condemned by the architect. The damage was caused by the new wall resting upon it. The defendant, Professor Kerr, also gave evidence. He said that he told Mrs. Timms that the expense of the alterations would be about 1,500*l.* He denied the statement that she did not wish to go beyond 600*l.* as the limit of expenditure. It was quite impossible that the damage could have been caused by the new wall according to his plans. Mrs. Timms did not adopt his plans as originally drawn out. As an indication of the sort of labour architects had to undergo, he further stated in cross-examination, that during the period from the 31st May until January last, he had no less than 120 interviews with the plaintiff. The architect ought certainly to see that work was properly carried out. Further evidence of no great importance having been given, his Lordship summed up the case. He pointed out that if an architect were employed to carry out a work of this character, it was professionally incumbent upon him to bestow a reasonable amount of care and skill upon the duties entrusted to his management. In the event of his neglecting such duties he must be held responsible. Had the defendant been in any way negligent in this case? He had drawn up certain plans, which were not carried out, but the work was commenced before he had drawn up others. The plaintiff contended that Professor Kerr had so prepared his plans that the chimney hung upon Mr. Daniel's party-wall and did it injury, and that he ought to have had the old wall rebuilt. As to the time in which the work was to be completed there did not appear to have been a definite contract. It would be for the jury to decide whether the works had been carried out under the defendant as architect, and if they were of opinion that he had not exercised proper skill, he must be responsible. If the builder, however, undertook to carry out special work on his own account during the absence of the architect, the latter surely could not be held liable. Eventually, the jury, after having retired for a short time to consider their verdict, found for the plaintiff as follows:—465*l.* on account of damage caused to Daniel's property; 200*l.* for loss of time.

*** The verdict in part appears so extraordinary and involves so serious a principle, that the profession generally are as much interested as the defendant in obtaining a proper reconsideration of the case.

A RAMBLE IN NORMANDY.

ARCHITECTURAL ASSOCIATION.

AT an ordinary general meeting of the members, held last Friday evening, the 20th inst., Mr. E. J. Tarver (president) in the chair, the following gentlemen were elected members: Messrs. E. Overall, A. J. Martin, F. Wheeler, W. N. Pogson, F. J. Banister, and H. Tupper.

Votes of thanks were passed to the two architects, Messrs. Gruning and Harris, who respectively conducted the members over the Royal Hotel, Blackfriars; and over the premises of Messrs. Foster & Sons, Lisson-grove, Marylebone-road.

Two drawings, submitted in competition for the title-page of the seventh volume of the Transactions of the Association, were exhibited, the secretary believing that Mr. Vialls's had obtained the prize offered.

Mr. T. Blashill then read a paper entitled "A Ramble in Normandy." In the course of his remarks he said that the ruins of the Castle of Arques, four miles out of Dieppe, had been fully illustrated by M. Viollet le Duc in his "Dictionnaire de l'Architecture," but its characteristic Norman keep, its formidable ditch (almost unique in design), and the additions made to its defences at successive periods, were a good study to select for students. Half a dozen miles from Dieppe was Varangeville, remarkable for its sixteenth-century manor-house, chiefly in brick, and its richly-decorated circular dovecot. Rouen was first described to him as the oldest-looking place and the dirtiest in the world; but since then whole blocks of ancient timber houses were missing, having made way for new streets; but even now it seemed to him the oldest and the most picturesque of the cities of the west. It was full of buildings over which one desired to linger long,—longest over the cathedral, where there was work of the purest as well as of the most florid period of art. Rouen, though the ancient capital of Normandy, was not rich in twelfth-century buildings. However they might spend the day, the evening would find them drawing towards the quay, with its cheerful *cafés*, and crowds of people enjoying their pleasant stroll under the trees; and students would probably think of the dreary mile of the Thames Embankment which only wanted houses, shops, and people to make it by day or night one of the most charming promenades in Europe. Leaving Rouen for Les Audelys, they came across the ruins of the most interesting castle in Normandy, the Château Guillard of Richard Cœur-de-Lion, which stands upon the top of a high chalk rock; and, whatever might be thought of its precise age, it would be for ever famous in the history of Mediæval military architecture. At Grand Audely was a fine church, with the western towers disfigured by immense staircase-turrets, with a north aisle of Italian design. The "Grand Cerf" was a fine timber building, with a good old fireplace; and if travellers stayed there, a wainscoted room, hung with ancient tapestry, was placed at their disposal. His recollection of Louviers by night was of dark and narrow streets, with the sound of water rushing through the numerous mills. A dark mass, which was the cathedral, with its fifteenth-century south porch of rich open work, with a central stone pendant, they could distinguish; the ranges of the thirteenth-century columns, carved statues, and the little lamp, like a bright star, in the distant chapel, were also of great interest; and the solitude of the silence reminded one of a dense forest on a still night. Evreux was another manufacturing town, kept lively by many swift streams which ran towards the Evre. It had many timbered houses, not very ancient nor very picturesque. The town lay in a hollow, amongst green and wooded hills, very pleasant to behold. In the cathedral the nave arcades were of rigidly plain twelfth-century work; and it was said to have been built by Henry I. of England, who burnt the town. It was a finely-proportioned building, although the work varied much in date. Near the deep and wide moat of the cathedral precinct were remains of the old Roman wall, exposed by alterations in progress, consisting of small square stones, with courses of tile between. Passing on to Lisieux, they came to the keep of the ancient château of Eouches, which stood out firm. Lisieux was the last of the cities in the valley that he saw; those who desired to study ancient timber construction should spend some days here, there being whole streets of picturesque wooden houses.

The Manor House of Mesnil-Manger, west of Lisieux, was one of the best examples of timber framing in Normandy; and from the railway one saw many quaint-looking houses, some churches, and circular stone dovecots, with old manors, which would repay a visit. Falaise, the birthplace of William the Conqueror, stood most picturesquely between two different kinds of country, but the town was more for the antiquary than the architect; but there was no one who might not profitably turn out of his way to see its picturesque old streets, with their sparkling fountains; the half-ruined gateways of its ancient walls; its churches; and principally its castle, which was, after Rouen, the residence of the Duke of Normandy. The roofs of the houses at Avranches generally were covered with shingles, cut out of the sweet chestnut, which abounded here; it weathered of a nice silver-grey colour, and formed a better compromise between the picturesqueness of thatch and the neatness of slate than he had seen. Many of the poorer houses were thatched, the straw being afterwards shorn neatly in diagonal lines a couple of inches apart, which gave an excellent finish to the surface. At Avranches were to be seen good remains of old ramparts, and nothing besides of any antiquity. At Mont St. Michael, a visit to the castles and the abbeys would be very advisable. The Hall of the Chevaliers was the most striking apartment; but everything was in some way worthy of special study; and not the least noticeable thing was that the whole was of a hard dirty brown granite, in which the most delicate mouldings and tracery had been carved, without regard to time or cost.

Mr. Spiers was glad that Mr. Blashill had brought the interesting subject before their notice. There was, however, some difficulty in describing such a tour as he had done, to make those who had not seen the various buildings thoroughly appreciate and follow the remarks. It was fortunate, he considered, that Normandy was so close to England, as he was of opinion that it was the best country in which to travel in order to obtain an idea of the development of Pointed architecture, which could easily be traced; and in some places visited by Mr. Blashill perfect gems of Pointed architecture could be seen. Some of the purest in France were those in the doorways of Lisieux. At Rouen there were some beautiful and perfect specimens of the fifteenth-century style of architecture; and as they were led from church to church, each specimen seemed finer than the preceding. Glancing at the chapel at St. Pierre, one could easily understand how the French architects, who probably at that time visited Rome, became imbued with the beauty of the old Classical work and with the Renaissance work of Italy, the chapels at St. Pierre being the finest specimens of Renaissance work that the student could see.

Mr. Quilter, who had visited many of the places alluded to, said that the reading of the paper revived in his memory much of what he had seen ten years ago. He was astonished to find at Bayeux, Caen, and the country north of these places, so many churches worth seeing.

The Chairman thought one of the most delightful things persons could do, was to put a 10*l.* note in their pockets, and a knapsack on their back, and make a tour through Normandy. He then alluded to the mixture of wood and stone in the structures at Bayeux, and to the chapels at Caen, and other places.

Mr. Blashill well illustrated his lecture.

New Town-hall for Limehouse. — The local authorities of the parish of Limehouse have resolved on building a new Town-hall, with public offices.

THE QUESTION, FROM ONE POINT OF VIEW.

CERTAIN conditions of climate, and certain phases of faith and opinion, have a paramount influence upon the architecture of a country. So marked is this influence, that we find that where the conditions are similar there is a similarity in the style of architecture; thus the ruins of ancient temples lately discovered in Mexico have a remarkable resemblance, both in form and detail, to certain Indian examples, and it appears undoubted that no intercourse subsisted between Mexico and Hindostan.

Given the conditions, the result may be arrived at. This being admitted, it is open to us to conjecture what the style of the future may be.

The tendency of the age is towards positiveness. We are eminently a practical people, not given to much display, but delighting in *comfort*, a thing so little understood by our neighbours that they have no word equivalent to it. When an idea is once seriously entertained by us we stick to it with remarkable tenacity; and so long as it is permitted to remain in quietude, and the absolute necessity of a change is not pressed upon us, we are contented to allow things to remain as they are. It is only of late that art has been looked upon in a serious light, as having an influence upon the material and social welfare of the community; and, strange to say, architecture has been the last of the arts to which public attention has been directed. Hitherto we have been content with a *resumé* of Classical and Gothic work, but now the demand is for something more.

In our fitful climate and varying light, the fine outlines and broad surfaces of Greek architecture lose their effect. The requirements of the climate, and the materials at command, are elements of insurmountable difficulty towards the true realisation of the effects of the style. The Greek ideal was as near perfection as possible; but it fails to touch the heart. Imperfect ourselves, we feel somewhat uneasy in our connexion with what is perfect. We admire it, but there is a coldness about it which does not lovingly attract. A monotonous repetition of the same features, however beautiful, becomes tiresome; formality and stateliness pall both mind and eye when there is nothing left for the imagination. A single inspection of a Greek temple enables the spectator to carry away with him a tolerably accurate recollection of its features and general aspect, and when seen from a distance its effect is poor, unless it be situated on a height.

A Gothic cathedral may be visited again and again, and still new beauties be discovered; it is a landmark seen from afar. The nearer it is approached the more impressive it becomes; its strongly-marked features and redundant details are required to produce effect against the grey sky. The grand west portal, with its flanking towers, is not repeated at the east end; but nave, transepts, choir, lady chapel, chapter-house, and cloisters, each tells a different tale; the eye wanders from one plane of surface to another, from buttress and pinnacle to clearstory and heaven-pointing spire; each window presents a differing maze of tracery; grotesque figures raise a smile here; a boss of foliage calls forth admiration there. Time's effacing hand only adds to its beauty; nature strives to enhance its loveliness; a gargoyle is rendered still more grotesque by a tuft of feathery grass hanging from his distended jaws; a coating of green moss upon a band of sculptured foliage adds to its beauty. Wild flowers bloom in sheltered crannies, and the birds of the air are at home amongst its bristling pinnacles and lofty towers. Enter the grand cavernous portal, and "the long-drawn aisles" stretch away like the glades of a forest; the clustered shafts, the deeply-recessed triforium, the light and graceful clearstory, and the vaulted roof, all bathed in a sea of glory shed around by the richly-tinted glass alive with strange imagery, form a picture of grandeur and beauty, combined with variety, not to be found in any other structure. The admiration of the people could not be destroyed by the teaching of pedants, and the revival of the style was received with acclamation.

When classical architecture was revived, much learning was displayed in discovering the laws by which its designers were governed, elaborate treatises were published, and rules framed, for the instruction and guidance of the profession. The effect of this was, that these rules were slavishly followed by those who could not think for themselves. The desire of being great at small cost, and the vulgar desire of excelling in profusion rather than in good taste, led to the vulgarising of the most beautiful ornament which came to be associated with the gin-palace and the casino. Admirable structures, erected in durable and costly materials, were reproduced in mean and perishable sham work. A reaction was inevitable, and the Gothic revival ensued.

The Gothic style is eminently constructive in its forms, and cannot be adequately carried out in any but durable materials. The architect is compelled to think; he has to throw the arch over a void, and to provide for the consequent strain. No definite rules were framed, or particular proportions insisted on, and he was thus left to produce new combinations, and develop old forms. The pointed arch, the leading and guiding feature of the style is, in certain circumstances, a source of embarrassment to the architect. This is especially the case in designing street fronts of several floors. The ancient examples of such amongst us were so few as to give the modern works of this class an aspect of entire novelty. The novelty has now lost its charm, and a feeling in favour of a more tractable style has arisen,—a style combining the truthfulness, variety, and picturesqueness of the Gothic with the common sense of the Italian, and the Queen Anne style appearing to some to possess these qualities, has been adopted by them. The style is one with few resources, and, judging from precedent, the continuance of its use will be of short duration,—a mere fashion of the day, with no solid basis upon which to build a superstructure,—and its influence upon the architecture of the future will be infinitely small as compared with the Gothic revival. The mere substitution of one style for another is no great achievement; much greater would have been the gain if one step in the direction of developing the styles already in use had been overcome.

One of the greatest faults of the modern architect is in his insistency in matters of detail, and the new examples of the Queen Anne style are no exception to this rule. An architect's work, truly, is only successful to the extent that it is homogeneous, but it may certainly be so without a slavish adherence to precedent. The motive, the ideal of the designer is often extremely shallow, exhibiting merely a superficial cleverness. A poor idea, however strongly expressed, is worthless. When every sentence, and every word in a sentence, is attempted to be made emphatic, the effect is exaggerated, and fails to impress (and, *per contra*, it may be remarked in passing that diffuseness is equally unimpressive).

In works upon a grand scale symmetry is desirable; but in those on a less ambitious scale convenience is generally the primary object, and this naturally leads to picturesqueness of effect. If the ornament is judiciously concentrated, leaving a sufficiency of wall-surface, so as to produce that repose and dignity which are essential to the production of a good design; if the various parts are appropriate and follow in harmonious sequence the building will be good, but not necessarily original: to be so, it must be the expression of the mind of the designer appropriately applying Nature's materials to man's use. He must work with a determined end in view, learning rather than attempting to appear learned, endeavouring to give birth to new thoughts and to embody new ideas. The purpose for which a building is intended being first ascertained, the function of each member should be predetermined, and not left to chance, the demands of utility being the first consideration. Although to a certain extent a sacrifice of convenience to æsthetic effect is highly commendable, yet, as a general rule, the effect should be evolved from the necessary conditions, and what is non-essential left for after-consideration.

To those who have carefully watched the progress of the art a development in a certain direction seemed to be unfolding itself, and may yet grow into greater proportions and bear good fruit. This growth was more apparent in the case of secular than of ecclesiastical architecture. The Pointed style is so thoroughly associated with our ideas of a church, and can be so readily and appropriately used in that class of buildings, that, in all probability, it will long continue to be used in such. But in secular buildings, composed of several floors, the Pointed arch is less traceable, and is often a source of embarrassment to the architect; the point of the arch cuts up into the ceiling, leaving little space betwixt its apex and the cill of the window above; and the flow of lines is apt to get confused if not carefully attended to. The expedient of filling up the upper portion of the window and making the opening square is somewhat of the nature of a makeshift, and the other expedient of imparting to two tiers of windows the effect of one, and arching the upper one only, is untruthful in expression.

The semicircular-headed arch is not open to the same objections; its crown can be kept well down, its frequent repetition produces a rythm and flow of lines which harmonise better with horizontal lines than the Pointed arch; it may be used singly or in groups, on a large or on a small scale, and it is capable of receiving a great degree of enrichment, which may, with perfect propriety, partake of a Gothic character. Shafts, mullions, and tracery may be made to perform a part in filling up a void, if too great to be left entirely open. It combines delicacy with strength, alternation of lines with breadth of surface, and may be made to produce a fine effect of light and shade. In every class of buildings it may be used with perfect propriety, from the cottage to the palace, whether the effect aimed at is breadth and massiveness or lightness and grace. Here, then, is a feature which the architect may use with the greatest freedom in any material, a feature which has never been used to the extent and in the manner which its capabilities are fitted to call forth;—a feature destined, we believe, to play a more important part in the architecture of the future than it has yet done.

The halt in the race will be but a short one; it will but slightly disturb the progress onward; the shadow has been mistaken for the substance. The ideas of the day must be told in a living language, the babel of tongues must be reduced to order, superficiality be superseded by substantiality, if architects are to hold their proper place in the estimation of their fellowmen.

SIGNET.

SOME OF THE SANITARY ASPECTS OF HOUSE CONSTRUCTION.*

Materials.

THE nature of the materials used in house construction has an important influence on the sanitary condition of the dwelling, and the health of its inhabitants. Walls are generally permeable to air. Professor Graham, in his experiments on the diffusion of gases, showed that this tendency to diffusion was not arrested by enclosing gases in cells with thick solid brick walls. Dr. Pettenkofer and others have made experiments on the passage of air through various materials. He states that in a room with brick wall, of 2,650 cubic feet of space, the temperature inside the room being 66 deg. Fahrenheit, and 32 deg. Fahrenheit outside, a fire being lighted in a stove, but all openings and crevices in doors and windows being thoroughly pasted up, a volume of air of 1,060 cubic feet per hour passed out of the room up the flues.

Dr. Pettenkofer also shows that with a difference of temperature inside the room to that outside of 9 deg.: 5 deg. Fahrenheit, the spontaneous ventilation through each square yard of a brick wall surface was about 7 cubic feet per hour; he does not mention the thickness of the wall.

Märker and Schultze, with the same proportionate difference of temperature, found the spontaneous ventilation was as follows, per square yard of surface in walls of similar thickness:—

Sandstone.....	4·7	cubic feet.
Quarried limestone...	6·5	,,
Brick	7·9	,,
Tufaceous limestone	10·1	,,
Mud	14·4	,,

This spontaneous change of air through walls is impeded if the walls are damp. Damp walls cause a great absorption of heat from the evaporation of the moisture from their surface. This absorption of heat of course affects persons near the wall, by absorbing the heat from the side of the individual nearest the wall, leaving the other side unaffected. This one-sided cooling of the body, or some part of it, is similar in effect to what is caused by draughts of air. It is dangerous from the local disturbance it occasions in the heat economy of the body. The emanations from the human body consist of a considerable quantity of watery vapour, which passes off

* From a paper by Capt. Galton, read at the Institute of Architects. See page 157, *ante*; and previously for report of discussion which followed.

from the lungs and skin. In a room with damp walls, and without means for frequent renewal of the air, this is confined, and the atmosphere of the room remains at a point of complete saturation. This in newly-inhabited houses is frequently the cause of the moisture seen on the walls. The quantity of water which will be contained in a new wall is very remarkable.* Suppose that 100,000 bricks are used for a building, each weighing 7 pounds; a good brick can suck up nearly 15 per cent. of its weight in water, but we will put down at 7 per cent. what gets into it by the manipulations of the bricklayer. We will assume that the same amount of water is contained in the mortar, a quantity certainly much understated, although the mortar forms about one-fifth of the walls; we have thus nearly 100,000 pounds of water, equal to 10,000 gallons, which must have left the walls of the house before it becomes habitable. This water must be removed by spontaneous evaporation into and by the air. The capacity of the air for receiving water depends on the different tension of the vapour at different temperatures, on the quantity of water already contained in the air flowing over a moist body, and finally on the velocity of that air. Assume the average temperature of the air to be about 50 deg. Fahrenheit, and the average hygrometric condition of the air to be 75 per cent. of its full saturation. At the temperature named, 1 cubic foot of air can take up four grains of water in the shape of vapour, but as it contains already 75 per cent. of these four grains, which amounts to three grains, it can only take up one additional grain. As often then as one grain is contained in the 10,000 gallons of water mentioned above, as many cubic feet of air must come in contact with the new walls, and become saturated with the water contained in them; or about 700 millions cubic feet of air are required to dry the building in question. The effect of a fire in drying the walls of a room will be seen from the following instance:—Take a room of 3,530 cubic feet, and the temperature and humidity of the air at the above given mean averages; as one cubic foot of such air is capable of taking up one additional grain of water, the air of the whole room will take up 3,530 grains, or about half a pound of water. Should there be no change of the air, matters would remain so. But by every fresh 3,530 ft. of air coming into the room another half pound of water would be taken up, and so on. Suppose the change amounts to 353 cubic feet per hour, all the moisture we get rid of would be only 353 grains per hour. But if we heat the room to 68 deg. Fahrenheit, for instance, we increase the tension of the vapour, *i.e.*, the capacity of the air for taking up water from four to seven grains per cubic foot, so that each cubic foot of fresh air entering the room is capable of taking up seven instead of four, that means four grains in addition to its original humidity. In consequence of this increased capacity the 353 cubic feet of air take up 1,412 instead of 353 grains of water. But by the increased difference of temperature between the room and the open air the ventilation will rise from 353 to 2,100 cubic feet per hour, and in this way we get rid of more than twenty times as much water as if we left the room unheated.

The damp having been expelled from the walls when the house is new, it is their proper function to prevent it entering from the outside. Damp should be precluded from rising into the wall from the ground, as before stated, by means of a damp course, and it should be prevented descending into the wall from above by an impervious coping of eaves. Improperly laid copings will act as conductors of wet into the wall, rather than as protectors against it. Damp should also be prevented from penetrating into the inner part of the wall, either by an adequate thickness of material, in the first instance, or by an impervious outer coating, or by an outer wall, separated from the inner wall by an air-space.

The quality and construction of the wall has an important bearing on the maintenance of an equable temperature in a house. The retention of heat is of as much sanitary importance as the prevention of damp. A cold, damp house is productive of draughts, and is the cause of rheumatism, bronchitis, catarrh, colds, &c.; and a house that requires a great expenditure of money for warming apparatus and fuel betrays a want of skill in the architect. The conducting power of different materials for heat has some bearing on this question, but the difference in the heat-conducting power of different materials used for wall construction soon disappears when the thickness of the wall is increased, and has little importance when a layer of air is introduced into the middle of the wall. Air when confined in a space between two walls is a most efficient retainer of heat, and therefore hollow walls not only prevent damp entering from the outside, but they retain the heat within the house; consequently, economy, dryness, and warmth would be best secured by the use of hollow walls, combined, if necessary, with an outer impervious coating. Any arrangement for ventilating the air-space in a hollow wall would destroy its efficiency as a non-conductor of heat. The wall, if of brick and plastered over, more or less admits air into the room, or allows of the exchange of air between the room and the outside. It also absorbs the moisture exhaled from the human body, and with it the particles of injurious matter which are constantly being given off from the lungs. Workmen employed in scraping down the walls of wards in hospitals are frequently taken ill from the effects of the deleterious matter they scrape off the walls. Attempts have been made to discover an impervious material for hospital ward walls. The use of glazed tiles for the wall covering is open to the objection that the numerous joints become receptacles of putrefactive matter; parian cement has been tried, but in proportion to the imperviousness of the wall, the watery vapour which emanates from the lungs becomes condensed upon it; and no cement is actually impervious, consequently it is a mere question of time how soon saturation will take place. Probably a plaster wall, of which the face is frequently scraped off and renewed, would be the safest wall for a hospital ward. In private houses the same conditions of impurity exist on a smaller scale. The wall, in process of time, becomes saturated with organic matter, and this is the cause of the musty smell which is found in rooms and houses which have been long in occupation without a thorough renewal of the wall covering. It is this which makes it essential to health that when the wall covering is renewed the surface should be scraped off and a new surface put on, especially in rooms which have been long inhabited.

The materials in common use for roof covering vary greatly in their properties: thus a roof covered with slates, supported on laths, throws off water, but is not impervious to air; if the slates be supported on boarding and laid on felt, or if bedded in mortar, the interchange of air is much more obstructed; if the covering be metallic the roof may be considered practically impervious; and if of asphalte absolutely so. Now, while a roof should be impervious to moisture from without, experience shows that it is unhealthy to live directly under a roof impervious to air. Therefore, whilst the outer covering of the roof should be impervious, and the roof should be so laid as to be retentive of heat, there should be a ventilated air-space between the porous ceiling and the impervious roof.

As regards floors, one of the most important conditions to be observed in the materials for floors in this climate is that they should not be cold to the feet; consequently wooden floors are desirable, unless the tiled floor is arranged so as to be warmed on the old Roman plan. The floor of whatever material it be should always have an air-space under it, so as to insure dryness. The floors should be laid with close joints. If wood floors they should be tongued, so as to prevent the accumulation of dirt liable to putrefy either in the joints or under the floor. This precaution, which in some parts of the country is adopted in work of the commonest class, is generally neglected in London. The frequent saturation of wooden floors with water to keep them clean, has the objection of diffusing damp through the atmosphere of the house; consequently a closely-laid polished floor possesses great sanitary advantages.

For windows, thick, clear glass is of great importance, because a window, if of thin glass, affords a large surface for cooling down the air of the rooms, and causing draughts. The loss of heat from 1 square foot of crown window-glass, of best quality, has been estimated to be equivalent to a loss of heat from 14 square feet of 14-in. wall. Of course, this is a mere approximation. I hope at some future time to lay before you some facts on the loss of heat through different kinds of glass. Glass is, however, a bad conductor of heat; and thick plate-glass is a great safeguard against the rapid cooling down of the air. Double panes have been inserted in sashes, to save heat by means of the air-space between them; but the difficulty of cleaning their inner surfaces is a bar to their adoption. Double sashes are universally adopted in the north of Europe, and are a most efficient means of preventing loss of heat.

Ventilation and Warming.

There are two terms applied to ventilation, viz., natural ventilation and artificial ventilation, which it is desirable should be clearly understood, as the difference is not very apparent. Ventilation is a movement of the air. Anything which disturbs the equilibrium of the air produces movement. The most usual cause of movement in the air which is apparent to us is heat. Heated air expands and moves upwards. Every breath of wind is the result of a disturbance of equilibrium by the upward movement of air, produced somewhere by the air being warmed. The sun shining will produce this effect. A fire lighted at the bottom of a shaft will cause the direct upward movement of the air over it, therefore this is natural ventilation. If the fire, instead of being applied directly to heat the air, is applied to a steam-engine, to turn a fan or to send steam into a shaft, and produce draught, partly by the vacuum it creates in condensing, partly by the velocity of its movement, and partly by the heat developed, it is called artificial ventilation. In houses it is generally more convenient to confine the arrangements for producing a movement in the air to the effect of the difference of temperature within and without the house.

The principles of ventilation, as regulated by the difference of temperature, are very simple, viz., heated air will ascend, and its place requires to be supplied by air admitted from the outer air. The reason why difficulties are experienced in the application of these principles is because of the various and complicated forms of house construction. A simple case of the difficulty of ventilation is that of smoky chimneys. In some cases the form of the house is such that its staircase acts as a large shaft, in which a large volume of air is being drawn upwards, and this draws in air from every available opening, and therefore, if adequate provision is not made for the admission of fresh air, it checks the draught which is intended to be established in the chimneys of adjacent rooms. I merely cite this as a simple case. The variety of ways in which the ventilation of one part of the house interferes with that of another are innumerable. It is the province of the architect so to correlate them, that either the ventilation shall act as a whole, or that the ventilation of each part shall act so as not to affect injuriously the ventilation of any other part.

The air of dwellings is rendered impure by the emanations continually given off from the human body. These emanations consist partly of carbonic acid gas, and partly of organic matter, very liable to putrefy. It is, moreover, polluted by the various processes of cooking, which diffuse a quantity of organic matter into the air; and when artificial light is used, if it be not burned in a vessel separate from the room, it seriously deteriorates the air. It is found, as a rule, that the deterioration by carbonic acid gas from breathing affords a very safe index of the total deterioration of air in a room by its occupants. The following facts should be borne in mind in considering this question. A man breathes, on an average, 16·66 cubic feet of air per hour, and produces from ½ cubic foot to ¾ cubic foot of carbonic acid, besides about half as much watery vapour, with organic matter, liable to putrefy. Each cubic foot of gas burned produces about 2 ft. of carbonic acid. Numerous experiments have been made upon the amount of fresh air which should be supplied to replace the deterioration of air. In England, the Army Sanitary Commission has been foremost in this matter, and very valuable experiments have been made by Dr. de Chaumont and by other members of the Army Medical Department. The Army Sanitary Commissioners considered, that for barrack-rooms, in which, by the custom of the service, the windows are kept open during most of the day, it was sufficient to provide for the renewal of the air during the night at the rate of 1,200 cubic feet per hour per occupant. The calculation was based on the nominal number of occupants; but in barracks men are nightly absent from every room, for guards or other purposes, and thus the volume of air renewed per man

* See Dr. Pettenkofer's lectures.

sleeping in the room was, in reality, much more than the nominal amount fixed.

Some of the general results obtained by Dr. de Chaumont and other members of the Army Medical Department, and by M. le Blanc, in Paris, have been collected into a paper, read last August, by General Morin before the Academy of Sciences in Paris.

He arrives at the following general conclusions. He assumes that the amount of carbonic acid and watery vapour which is exhaled per individual in ordinary health per hour, and which requires to be removed in order to maintain the purity of the air, is 1·06 cubic feet. In hospitals the average amount is 1·41 cubic feet. For lying-in women 2·12 cubic feet. The amount of carbonic acid assumed to be present in the fresh air out of doors is 0·0005 cubic feet; of course this is subject to variation, it is found to be as low as 0·0003 and as high as 0·0006. The amount of carbonic acid which it is assumed may be present without injurious effect in a room is 0·0008. The volume of air which should be removed and replaced by fresh air per individual per hour, in order to obtain a uniform degree of impurity in a room, will thus vary with the cubic space of the room occupied by the individual or individuals whose emanations are rendering the air impure. But after the normal degree of impurity in the air in the room has been obtained, then the amount of fresh air required to keep up the equilibrium will be uniform.

The following table shows the amount of fresh air required according to General Morin's conclusions for bringing the air of a room into the normal condition of impurity, viz., to contain the proportions of 0·0008 of carbonic acid :—

Room containing cubic feet.	Amount of vitiated air to be extracted, and of fresh air to be admitted per hour for each individual in ordinary life.
353·2	3178·80
423·84	3108·16
565·12	2966·88
706·4	2825·60
1059·6	2472·4
1412·8	2119·2
1766·0	1766·0
2119·2	1412·8

Thus a bed-room 12 ft. by 15 ft., and 9 ft. high, which is generally considered a sufficiently large room for one person, requires, if a proper degree of purity of air is to be maintained in it, that the air should be renewed at the rate of about 1,880 cubic feet per hour for each individual occupying it. In a common lodging-house, six persons could, under the Act, sleep in such a room; the air to be removed and the fresh air to be admitted for this number, will be 11,200 cubic feet per hour. If the room had a fire at bed-time the velocity of air in the flue at about three or four o'clock in the morning would probably, with an ordinary average outside temperature, be about 2 ft. per second. An ordinary flue of 14 in. by 9 in. would under such conditions remove about 6,500 cubic feet per hour; but the law makes no provision for flues in sleeping-rooms, except in the case of cellars; and, moreover, the absence of inlets for fresh air to replace that drawn off by the chimney-flue materially checks the draught in the flue. If in such a room no arrangement is made for the renewal of the air, in a ten-hours period of night occupation of the room, the amount of carbonic acid and other emanations from each occupant diffused through the air would be ten times as great as the usual amount in fresh air, and with the six occupants might be fatal. The safeguard in practice against such extreme vitiation is the badly-fitted doors and windows, through which some exchange of air takes place, and the exchange is much accelerated by the lowering of the temperature of the outside air during the night.

In rooms occupied as living-rooms the air deteriorated by the burning of lights must be provided for in addition to that due to the occupants, and (as shown above) an ordinary gas-burner deteriorates the air as much as six individuals at least. These facts bring home to the mind the importance of providing in a systematic manner for the renewal of the air of all inhabited spaces: that is to say, the removal of the vitiated air, and the introduction of fresh air.

In this country the main engine for the removal of air from our rooms is the open fire-place. With an open fire-place, having a flue 14 in. by 9 in., a velocity will frequently prevail in the chimney of 10 ft., and in some instances of 15 ft. per second, thus causing the removal of from 30,000 to 45,000 cubic feet of air per hour. But as a rule there is no provision whatever made for replacing the air thus removed. It is allowed to find its way into the room as best it can, by crevices in doors and windows and through the walls. We therefore perpetually hear complaints of draughts, of colds, &c. Our open fireplaces merely warm us by direct radiation of the fire. The hotter we make the fire the more heated air do we send up the chimney, and the more cold air do we bring in to supply its place; thus we are roasted on the one side and frozen on the other, and at least five-sixths of the heat generated by the coal passes up the chimney. All our fireplaces on this construction are simply barbarisms. In some houses, especially those of the better class, fresh air is admitted to the rooms to supply the open fire, and to the staircase after it has been warmed at some central warming apparatus. But this system is wasteful of fuel, as it allows the heat from the fireplaces to pass up the chimney unused, except for the purpose of creating more draught than is required. Consequently the most sensible form of construction for open fireplaces, is one which will utilise some portion of the spare heat which otherwise passes (entirely wasted) into the chimney-flue, in such a way as to warm the fresh air required for replacing that which is being carried up the chimney. This fresh warmed air should be admitted into the room in some part where it will flow in without causing a sensible draught. It was on these grounds that the ventilating fireplace adopted in barracks and military hospitals was designed by me.

In a room in which there is an open fire, the air near the floor-level is drawn towards the fire, a portion passes away up the flue, but the remainder is carried up in front of the chimney-breast, and thence it passes along the ceiling to the end of the room opposite the fire, when it is drawn out to supply the place of that which is passing along the floor to the fire. The air is thus in continual circulation, and the place at which fresh warmed air can be admitted with least disturbance to the currents and least perceptible effect is high up in the chimney-breast. I therefore selected that place for the admission of the fresh warmed air, because any inflow of air, even at a temperature of 70° or 80° will be felt as a draught if it impinge on any part of the body. It will thus be seen that this fireplace, whilst it provides for the extraction of a sufficient volume of air from the room, provides also for the admission of an adequate supply of fresh warm air to replace that which has been removed. It preserves an equable temperature in all parts of the room; it will afford the same amount of heat as a well-constructed ordinary fireplace, with one-third the amount of fuel; it will not smoke, and when there are two fireplaces in the same room, of which only one is lighted, it will prevent down-draughts in the unused chimney-flue.

In towns, and especially in London, the air is rendered so impure by soot and other matters, that any current admitted continuously at one place soon blackens the adjacent walls and ceiling. The only remedy for this is to pass the fresh air to be warmed in the chamber at the back of the fire, through a filter of cotton wool, to remove the blacks and other impurities.

THE ADVANCE, CRAB FASHION.

A good deal is being written and said about the economy and goodness of wooden houses, and doubtless under some circumstances, and in certain positions, such erections may be very usefully adopted. It cannot surely be desired, however, by any person of sound judgment that we should return to wood as a building material? If we must retrograde it would be safer to go back to "wattle and dab." When the present pattern-books have become a little stale some enterprising young architect might find it worth his while to write a few smart letters as to the desirability of returning to the Ancient British style, and dwell with *gusto* on the usefulness and truthfulness of the native Wigwam. If he can succeed in getting another young architect or two to write about him, either with praise or ridicule, it is immaterial which, he may become quite a notoriety in his circle before the public find out the sad weakness which is at the bottom of it all.

ROUNDHAY PARK COMPETITION.

The Town Council of Leeds have awarded the first premium, 200 guineas, to Mr. Geo. Corson, Leeds; the second, 100 guineas, to Messrs. Hornblower & Son, Liverpool; and the third, 50 guineas, to Messrs. W. Perkin & Son, Leeds. Descriptive particulars of these and all the other designs will be found in our last volume (xxxi.), p. 739. The council spoke well of the designs submitted by Mr. Milner and Mr. Hennell.

THE DUBLIN SCHOOL OF ART.

The annual distribution of prizes to the Schools of Art in connexion with the Dublin Society, took place on Friday in last week. The prizes were delivered by the Lord Lieutenant, Earl Spencer, and it was also the last public appearance of the Viceroy as a representative of her Majesty, before his departure. From the report of the head-master, Mr. Edwin Lyne, it appeared that the works in drawing, painting, modelling, &c., representing nearly every stage of art-instruction, were forwarded to London in April last. The total amount of such studies was 893, as compared with 581 similar works forwarded in 1872. The number of students attending the schools during the past year has been 452, of which number 222 were males, and 230 females. The total number of artizan students amounted to 274, of which number 215 were males, and 59 females.

The results of a comparison made between the Dublin Society school and the schools in connexion with Glasgow, Edinburgh, Birmingham, and Manchester, showed that in the highest grade in Glasgow school, the highest prizes had been awarded as follows:—In Glasgow, to 1 student in 53; in Birmingham, to 1 in 26; in Edinburgh, to 1 in 14; in Manchester, to 1 in 17; and in Dublin, to 1 in 8. A similar result, applied to other grades, showed the favourable comparison the Dublin school could bear with the other large schools in connexion with South Kensington.

His Excellency in his address complimented the Dublin Society on the success of its school, and paid tribute to the ability of the head-master. Comparing the past with the present, he said:—"I think, if we look back at high art in ancient days, we shall find a great difference from the present. In old days we would see one great master with a school of artists following his particular style of treatment. In the fifteenth century we find almost all the great works of art treating of religious subjects. Now, I think we see a great difference. I do not know whether it is that we decorate and do honour to God in our churches in other ways than in painting, or whether artists of the present day are timid in trying to follow the footsteps of the great men who painted in former days; but we see on the walls of our picture-galleries every kind and description of art. We find the independence and originality of English and Irish thought breaking out in all directions; and, if we lose somewhat of symmetry from one particular school, we gain much in originality and thought. This is especially shown in the works of the great man who died during last year—Sir Edwin Landseer. In former days Wouverman and Snyder delineated with great force, great grace, and great vigour animal life, but where can you find the wit, humour, or touch of feeling which appears in the pictures of Landseer."

Earl Spencer, having on a former occasion advocated the formation of a Central Museum of Ornamental Art in Dublin, expressed his regret that the project was not realised during his tenure of office; but he hoped that his successor would see a City Museum of Ornamental Art established, which he deemed a matter of importance to all lovers and students of art.

The Loan to the Metropolitan Board of Works.—In response to the proposal of the Metropolitan Board of Works to borrow 2,500,000*l.*, offers in one day were made to lend them 21,236,750*l.*! The Board, therefore, at once completed an issue of Metropolitan Consolidated Stock to the required amount. Does the extraordinary abundance of capital, one may ask, indicate fairly the prosperous state of the nation, or does it imply the existence of any check to the application of capital to other purposes or in other directions?

METROPOLITAN WORKHOUSES.

THE guardians of St. George's, Hanover-square, have determined to adopt the suggestion of their architect, Mr. H. Saxon Snell, for enlarging Little Chelsea Workhouse, to accommodate the whole of the inmates of this union. For this purpose additional ground will have to be purchased adjoining the workhouse, and the guardians have determined to put in force the compulsory powers of purchase conferred upon them by the Poor Law Act of 1867. The estimated cost of the land and buildings is 77,000*l.*, exclusive of the chapel. A receiving-house and casual-wards, with relieving-offices and dispensary, in some central position of the union, will also be erected when a suitable site is obtained; but, for the present, the Mount-street Workhouse will be utilised for this purpose.

The St. Marylebone Board of Guardians have received the assent of the Local Government Board to the immediate erection of new administrative offices and board-room, on the site of their workhouse in the Marylebone-road, and they have given their general approval to the proposed reconstruction of the whole workhouse, according to the designs of their architect, Mr. Snell. As soon as a suitable site can be obtained the infirmary will be removed to a new building for this class of inmates erected elsewhere.

Tenders will shortly be invited by the St. Marylebone guardians for the erection of a new dispensary and relief-office, in Little Union-place, Lisson-grove, from plans prepared by the same architect.

The Local Government Board have authorised the erection at St. Luke's workhouse, in the City-road, of an additional block of buildings, for chronic and infirm inmates, at a cost of 15,000*l.* as estimated by Mr. Snell. When these works are completed, half of the intended new buildings will have been erected, and the remaining portion will no doubt be proceeded with in the early part of next year. The administrative block of buildings for this workhouse, now in course of erection, will very shortly be completed.

The St. Olave's Board of Guardians will receive tenders this week for the enlargement of their infirmary at Rotherhithe, in accordance with the designs prepared by the same architect, and at an estimated cost of 15,000*l.* The new buildings will contain novel features in the way of ventilation. Tenders for casual wards adjoining the above workhouse will be received at the same time. These wards, which are designed on the cell system, likewise contain novel features which have received the special commendation of the Local Government Board.

THE CHURCH AND THE PEOPLE OF KENSINGTON.

SIR,—In no parish of England do we find a church better sustained than that of this royal town. A very large sum has been lately expended on the erection of a good specimen of modern Gothic architecture; but no equivalent concession has been made to the inhabitants for the large outlay dedicated to ecclesiastical purposes.

The churchyard railing, which forms the segment of a circle, obtrudes upon the High-street at its junction with Church-lane (the only traversed road northward for two miles from Piccadilly), reducing the carriage road to a width of only 13 ft., and yet the interior portion of the cemetery has had no tombs or interments within 12 ft. or 15 ft. of the boundary rails: thus leaving ample space for the due enlargement of this important thoroughfare, if the spiritual authorities would only pay a little more attention to the worldly interests of their parishioners. This, however, is not the only inconvenience long endured by the large and growing population, as there is quite as much a necessity for a very short footway of only 160 ft., between Palace-garden-terrace, Camden-hill, and Kensington Palace-garden-road, leading to the gardens. There is a footway across this small angle of the vicarage grounds (close to the iron church), having a doorway at each end of the 160 ft., but these doors are only open for public use during divine service.

There are five acres of meadow and plantation bordering the most valuable precincts of the park and palace, of little use as pasture, but perhaps indispensable to the retired meditations of the pastoral incumbent.

Seeing that so large an area belongs wholly to the church, surely it might reasonably be expected that some small concession of free user be made to the public over this short footway of 160 ft. in length by about 7 ft. in width.

The solace of such an aisement would be an inestimable boon to all the inhabitants of the highly-valued and yet improving neighbourhood of Camden-hill; and it would be more consistent with the spirit of our reformed creed to "open wide the gates and make the way straight" than to obstruct public requirements, and withhold a privilege of necessity, seeing that the whole parish petitions for it. QUONDAM.

BUILDERS' CONTRACTS.

SIR,—The case stated by Messrs. Blandford & Jones, in your issue of the 21st inst., is one on which there should be no doubt whatever.

A builder's tender is merely an offer to do certain work at a price stated. He may withdraw it at any time before the acceptance by the principal for whom the works are to be executed.

The tender itself is therefore no contract; but so soon as the tender is accepted in writing by the principal, or by the architect, being so specially instructed on his behalf, the contract is complete.

If the form of tender prepared by the architect states that "the builder agrees *and is willing to contract* to perform the works," it implies that the principal does not intend to rely on the contract as perfected and completed by the tender and its acceptance, but that a more formal contract is to be executed.

If the written contract as prepared by the solicitor acting for the principal is tendered to the builder for execution, and he signs it, the presumption is very strong that the principal is prepared to execute it also; and if he does not execute it, it is too late for him to withdraw.

The builder would doubtless be entitled to claim, at his option, either for the expenses incurred in preparing his estimate, or for loss of prospective profit, *but not for both.*

WILLIAM ELLISON.

FIREPROOF WAREHOUSES.

SIR,—The total destruction of the Pantechnicon by fire will bring you a great many letters from architects and others, suggesting different modes of constructing fireproof buildings. If you can find room I should like to give you my opinion, as a builder, as to the best mode of doing so.

The failure of the Pantechnicon, and many of the so-called fireproof buildings, has arisen from the use of iron, stone, and other materials which are not fireproof, and also from the contents of such buildings taking fire and burning for some time before attention has been called to it, and inability to deal with the fire when found. What is therefore wanted, is a building entirely constructed of fireproof material. This can be done by using the best and cheapest, viz, brick. It is also necessary that any building used for the purpose of warehousing goods of a combustible nature should be divided into separate compartments, having no communication with each other, and being under immediate control in case of fire. There should be no windows, and but one door, and that in the external wall. This door should be made to fit air-tight. There should be in each compartment, for ventilating, one air-shaft, formed in the solid brickwork, and leading to the top of the building, projecting above the roof about 2 ft., and numbered. Gas should be used for lighting, a stop-cock being placed on the outside of the building, close to the door. There should be also another series of pipes following the direction of the gas-pipes, having the outlet close to the stop-cock on the outside.

The mode of construction would be as follows, viz.:—A range of warehouses side by side, say each 25 ft. wide, by any length, the ceiling constructed of an arch of one span, with a springing sufficient to carry the weight of the floor above (the spandrels of this arch being filled up level with the crown of the arch, and finished in Portland cement, would form the floor of the warehouse above); similar buildings may be ranged side by side, and in any number, one above another: the last in height would be weathered on the top to form the roof; heavy goods would be stored on the ground-floor, and light goods on the upper; light iron staircases would give access to the upper ones on the outside of the building.

We will suppose such a compartment as here described filled with goods of the usual description, and a fire breaks out from spontaneous combustion or otherwise. The first indication would be smoke; this would find no escape but through the ventilating-shaft, and would be detected at once by the watchman (whose duty it would be to patrol the roof of the building day and night to watch the condition of the ventilators); on the smoke emerging he would immediately stop up the shaft with a stopper at hand for that purpose; the door being shut, and fitting airtight, the fire would soon be smothered. On the outside of the building, near the door, a fire-annihilator would discharge gas into the building through the pipes provided for that purpose, and following the line of the gaspipes, which would put out the fire without destroying the goods.

The advantages of this mode of constructing fireproof buildings would be cheapness, the absolute certainty of dealing with fire, which has hitherto baffled all attempts to control, and would supersede the very expensive system of water hydrants, which are seldom of use at the proper time, and which do as much damage as the fire. J. P.

BARS INSTEAD OF BELLS.

SIR,—Will you allow us to state in your next impression, in reply to your correspondent, Mr. Chas. Turner, that we have made inquiries through various channels, but cannot find that steel bars have been successfully, if it all, used instead of bells in churches. In one case we know of, they were used in an organ, but without success, and bells were substituted for them. Iron bars and large flat pieces of wood are, however, used in some parts of Turkey, instead of a bell, in Christian churches, bells not being allowed by the Mohammedan authorities. In each case they are loosely suspended by the centre, and a man strikes them with a wooden mallet. We are, however, using hemispherical bells, which are very much less costly than the ordinary church-bell, and machinery, instead of ringers, with great success. Our Mr. Lund is going to read a paper upon the subject before the Society of Arts on the 4th of March next.

LUND & BLOCKLEY.

ARCHITECTS' ACTIONS.

PUGIN *v.* MOLLOY.

THIS trial, which has been before the court for the last two years, was called on for hearing on Friday last before Mr. Justice Brett, at the Guildhall.

Mr. Willis appeared for the plaintiff, Mr. Hopwood, Q.C., M.P., and Mr. Bullen for the defendant.

In this case the plaintiff sought to recover a sum of 2,240*l.* for designs and work and labour done in connexion with some buildings at Hanley, in Staffordshire. The plaintiff's counsel stated that the contract for the buildings actually erected was under 1,000*l.*, and that three sets of plans and specifications had been prepared for the same buildings. In the last set, a considerable number of reductions had been made by the direction of the defendant, in order to reduce the cost of the building. It was also contended that, after the contract which referred to the reduced specification or quantities was signed, the defendant, unknown to the plaintiff, had substituted the specification prepared for the first set of plans, in place of the quantities which he himself had ordered to be prepared; the defendant having the power to do this, acting, as he did for some time, as clerk of the works. This substitution involved an additional outlay of some 600*l.*, which at one time the plaintiff was willing to settle for a nominal sum of 80*l.* This, however, was not acceded to by the defendant, and the matter was then referred by plaintiff to the sole arbitration of the Bishop of Birmingham. For various reasons the Bishop declined to act: hence the action. For the defendant, Mr. Hopwood stated that he depended for his defence upon a point of law, and contended that the contract was binding, inasmuch as it referred to the first specification above alluded to, which, according to the terms of the contract, should have been signed and marked A. When, however, the specification was handed in, it was found that it was neither signed nor marked A. At this stage, his lordship ruled that the plaintiff had a just and valid claim for the difference between the actual specification or

uantities and the amount of work which had been executed, and said, as it referred to measurements it was clearly a matter which could not be tried in that court, but must go to arbitration. He therefore gave a verdict for the plaintiff, which carried the costs of the cause, which on both sides are said to amount to over 1,000*l.*

An offer of compromise was made to the plaintiff, through Mr. Willis, when he replied, "I will not now accept 10,000*l.*; in fact, I will accept no terms. The case must be tried out."*

LONDON WATER SUPPLY AND FIRES.

RECENT calamitous occurrences were scarcely needed to impress the public with a sense of the importance of constant water supply at high pressure, readily accessible by hydrants, as a means necessary for the speedy extinction of accidental fires. The Metropolitan Water Act of 1871 provides powers to compel the water companies to give constant supply, but either the public authorities, or the companies, or both, seem supine in carrying the provision into effect. It appears from the last monthly report, just presented to the Local Government Board, at Whitehall, by Major Frank Bolton, water examiner, that about a third of the water-mains of the metropolis are constantly charged, and hence available for being fitted with hydrants, that have not as yet been substituted for fire-plugs. The extent of the mains in the different districts of the metropolis to which hydrants could be fixed at once, such mains being constantly charged, is as follows:—Kent Company, 64 miles; New River, 168; East London, 70; Southwark and Vauxhall, 100; West Middlesex, 65; Grand Junction, 41½; Lambeth, 90; Chelsea, 50; making a total of 618½ miles. Hydrants fixed at 200 yards apart over this aggregate lineal of mains would give a total of more than 5,700 hydrants, whereas the number fixed is only 2,360, with thirty in course of erection, or a trifle over half the proper provision.

THE NEW POST-OFFICE IN CARLISLE.

THE alteration in the Athenæum for the purpose of adapting it to the use of the Carlisle Post-office and Telegraph Department has been completed, and the business removed there. The entrance to the public office, in which money orders are also granted, is through swinging doors at the south entrance, formerly the way into the Assembly-room. The dimensions of the public office are 31 ft. 6 in. by 19 ft. 5 in., and in it provision is made for the writing of telegrams. There is a doorway in the public office leading into that of the Postmaster, whose room is 16 ft. 6 in. by 14 ft. 6 in. Another door from the Postmaster's office leads into the lobby of the old lecture-hall, to the front door of which the letter-boxes have been fixed. The floor of the lecture-hall has been raised to the level of the front entrance, and the ceiling having been removed, the assembly-room is also taken in, and the two form a large and lofty sorting-room, with retiring-rooms for the clerks, telegraphic battery-room, and mechanics' workshop underneath. The dimensions of the sorting-room are 56 ft. 4 in. by 46 ft. 6 in., and the height to the top of the skylights 41 ft. 6 in. The telegraph-office is in what was formerly the old museum, the gallery of which has been removed, and light obtained from the roof. The dimensions of this room are 22 ft. 9 in. by 25 ft. 3 in. The retiring-rooms for the clerks are large and lofty.

SCHOOL BOARDS.

London.—The new school in connexion with the School Board of London in Westmoreland-road, Walworth, is opened. Mr. E. H. Currie, vice-chairman of the Board, presided over a public meeting in the boys' school-room, and in the course of his remarks he said that the cost was rather heavy, amounting to 8*l.* 5*s.* 9*d.* per head. The rooms would accommodate 314 boys, 320 girls, and 452 infants. The architects, Messrs. Jarvis & Son, were selected by competition. In London there were at the present moment 88 schools, either opened or building by the School Board, and by the end of the present year the Board would have provided accommodation for 80,000 children.

* This report comes to us with authority, but certainly does not make the merits of the case very clear.

Leeds.—At the last monthly meeting of the Leeds School Board, Mr. John F. Hennessy, pupil of Messrs. William Perkin & Sons, architects, Leeds, was appointed second assistant in the office of the architect.

Middlesbrough.—The foundation-stone of a school to be erected by the Middlesbrough School Board at Linthorpe, has been laid by Mrs. Bolckow, of Marton Hall, in the presence of a good attendance of spectators. The locality seemed to be surrounded by brickyards and fields under tillage, but by the time the school is completed it is believed houses will be springing up around it, so rapid is the progress made by this town. The schoolroom to be erected now will hold 300 children, and two wings will be added as the population of Linthorpe increases. At present there will be room for 300 infants, with four class-rooms. Mr. Blessley is the architect of the Board and of the school.

Llanaelhaiarn, Carnarvonshire.—The School Board of Llanaelhaiarn formally opened their new school on Monday last. The school has been erected from the plans of the architect to the Board, Mr. Walter W. Thomas, Liverpool.

STRONG ROOMS.

SIR,—In your notice of the new branch of the National Provincial Bank of England, at Middlesbrough, you fully describe the strong room and its massive doors and gates, but you omit to mention that the whole of this work, constructed of hard steel and wrought iron, was executed by us.

CHUBB & SON.

LIGHT AND AIR CASES.

ARDEN *v.* MEEKING; GRIGG *v.* MEEKING.

THESE were light and air suits at the Rolls Court, before the Master. The first of the bills was filed by the owner of Nos. 75 and 76, Fetter-lane, for an injunction to restrain Messrs. Charles Meeking & Co., the linendrapers, from raising a portion of the great pile of buildings they have been for some time past erecting in Holborn and Fetter-lane to such a height as to interfere with the access of light and air to the plaintiff's windows opposite.

The other bill was filed by a tradesman renting the premises alleged to be injuriously affected. As Fetter-lane is only 22 ft. wide at the spot in question, and the defendants' building is intended to be 72 ft. 6 in. high, being about 32 ft. higher than the house which used to stand on the site, it was clear that there must be some obscuration of the ancient lights. The evidence as to the *quantum* of injury was wholly theoretical, as the building complained of has not yet been carried up to the height of the old building.

The Master of the Rolls, without hearing a reply, said he disliked having to decide the case on the only materials before him—namely, the mere opinion of experts; and he felt a natural inclination not to stop the march of improvements and prevent the erection of one of those splendid buildings which were now to be seen rising everywhere in the streets of London. But it was settled that the Court ought to grant an injunction wherever it was satisfied that a building would materially obscure that amount of light which the person complaining had a right to by law—namely, sufficient light for the purposes of his business. In a narrow London lane, such as Fetter-lane, there could be no reasonable doubt that all the light that reached the windows of a house would be no more than sufficient for the enjoyment of the house according to the ordinary notions of mankind; so that practically the occupier of a house in such a situation would be entitled as of right to all the light he enjoyed. It was admitted that the proposed building must obscure some portion of the sky area, and the only question was whether the effect would be materially and substantially to obscure the light. The evidence as to this was contradictory; but taking a mean between the two extremes, it would seem that as much as 30 per cent. or nearly one-third of the light would be obscured. This could not but be a material interference with the rights of the plaintiff. He must therefore grant an injunction in both suits restraining the defendants from erecting any building on the site of the old buildings in Fetter-lane, beginning at a point 17 ft. north of the plaintiff's houses, to a greater height than the old buildings, so as to darken, injure, or obscure the ancient windows of Nos. 75 and 76, Fetter-lane. Costs to follow the event.

CONTRACTOR'S LIABILITY.

IN the Court of Exchequer (Nisi Prius sittings, at Guildhall, before the Lord Chief Baron and a special jury), the case of Zellwood *v.* Pearson was an action to recover compensation in damages for serious injuries resulting in death sustained by the husband of the plaintiff in consequence of the alleged negligence of the defendant's servants.

The circumstances of the case were rather peculiar. The plaintiff was a widow with six children, who complained of being deprived of her husband and her means of support by the act of the defendant's servants. The deceased was an army accoutrement maker, residing in Union street, London-road. On the 25th of August, soon after leaving his own house, he was greatly shaken and alarmed by a loud explosion in No. 16, Union-street, immediately opposite to him. The house was completely blown up from an escape of gas, and several persons inside were seriously injured. After the shock he rushed over to render what assistance he could, but on returning to his house he was taken alarmingly ill, and after about six weeks' intense suffering died raving mad. The defendant was a sewer contractor, carrying on business in the Borough, and had been employed some days before repairing the pipes in Union-street, in front of the house in question. His men were engaged in removing the smaller pipes, and replacing them with 6-in. drain-pipes. In the course of their operations they dug out a quantity of the earth underneath the gas-pipes with the view of replacing it with gravel. A cart which they were using at the time having been backed over this particular spot, one of its wheels caused the breakage of the gas-pipe. The gas percolated through the drain and entered the house referred to. Coming in contact with fire, the explosion was the result.

A coroner's inquest was held upon the body of the deceased, when a verdict of accidental death was returned; the presiding officer, however, observing upon the negligence of the defendant's men, and his responsibility in consequence.

Dr. Donohoo, parish surgeon, stated that the cause of death was a serve shock to the nervous system by reason of the explosion. There was an effusion of lymph on the brain.

Mr. Serjeant Parry, on behalf of the defendant, submitted that, even assuming there was negligence proved, this action could not be sustained, as there was no evidence to show that there was an actual injury inflicted on the deceased by the explosion, and that the mere fright or shock produced by the noise or the explosion, though it might have conduced to his death, was not actionable. It appeared that the deceased had suffered a mere mental shock.

The Lord Chief Baron overruled this objection.

The learned Serjeant, having then consulted with his client, stated that he would consent to a verdict for the plaintiff,—damages 150*l.*; that was, 100*l.* for the widow, and 50*l.* for the four younger children.

Verdict accordingly.

THE DELIVERY OF WATER AT FIRES.

SIR,—The present plan at a house on fire is for the fireman to hold the hose so as to send the water in a slanting direction upwards into the building on fire; by this method it would seem that much water is lost, because not distributed sufficiently. This suggests the idea that if a fireman was elevated on a high platform, so as to send a stream of water straight into the rooms of a building on fire, it would be more effective.

To give a rough description of such a high platform, suppose a wagon, with upright poles at each corner, 30 ft. or 40 ft. high, and two or three platforms at distances of, say 10 ft. or 12 ft., for men to stand on; the hose, being held at an elevation, could deliver water straight forwards, and I imagine by this process the successive shoots of water would command a larger surface of fire than the present system of shooting the water upwards in a slanting direction.

ILEX.

*** Not very practicable.

DISHONEST WORKMEN.

MESSRS. CUBITT would appear to be rather unfortunate in the selection of their workmen; but in consequence of observations lately made, the foremen have taken up detective duties, and very cleverly has Mr. W. J. Hoskins, foreman to Messrs. Cubitt, discharged his new office; for by his means three labourers in the employ of the firm, named Gunning, Jones, and Gibson, have been detected in stealing a large quantity of new lead from the roof of Peabody's Buildings, now in course of erection in Broadwall, Lambeth.

Mr. Hoskins stated to the Court that he was foreman of the job at Peabody's Buildings, which were being erected by Messrs. Cubitt, and the three prisoners were employed as labourers. On Saturday afternoon, after they had left work, he entered a public-house in Hatfield-street, near to the works, and noticed the prisoners talking to a marine-store dealer. As soon as they caught sight of him they suddenly disappeared; but witness followed up, and saw money passing between them. On the same morning he had discovered that a large quantity of new lead had been stolen from the roof of the buildings, which had only been laid down ten days before. In consequence of his suspicion, he gave information to the police, who apprehended the three men at the bar.

The magistrate at once committed all three of the prisoners to the Surrey Sessions for trial, and complimented Messrs. Cubitt's foreman for his ability as an amateur detective, and his vigilance in looking after his employers' property.

POURING SEWAGE INTO RIVERS.

IN the Court of Chancery, before the Lord Chancellor and the Lords Justices, the appeal of the Attorney-General *v.* The Mayor, Aldermen, and Burgesses of Barnsley, has been concluded. The appeal was brought by the Corporation of Barnsley, who are also the Local Board of Health of that town, against an injunction, granted by Vice-Chancellor Hall, on the 11th December last, restraining the defendants from continuing, after the 22nd May next, to permit the discharge into the River Dearne of any sewage or other noxious or offensive matter from the borough, or any works within it, either by the existing main sewer or by any other channels under the control of the defendants. The defendants were also ordered to pay the costs of the suit. The suit was commenced in 1871, by information and bill, the relators and plaintiffs being Earl Fitzwilliam, Viscount Halifax, and Messrs. R. Micklethwaite and F. H. Taylor, who are owners of land on the banks of the Dearne.

Lord Justice James said that the case made by the plaintiffs, and supported by a mass of evidence, was that the water of the river is polluted to a great extent; that there is a great mass of fetid deposit; that the water is rendered wholly unfit for domestic use, and indeed for almost any use whatever; that fish cannot live in it, and that a very foul stench arises, which is destructive of comfort, injurious to health, and not unlikely to become epidemically pestiferous. It was admitted by the Corporation that the river is extremely offensive, and that it produces injurious effects; but they said that they are taking gravely into their consideration how to reconcile the interests of the complainants with those of the ratepayers, forgetting apparently that they themselves represent the ratepayers, and are not competent to decide such a question, and forgetting that the rights of inhabitants and landowners outside the town of Barnsley are paramount to those of the ratepayers. This was the position assumed

by the Corporation before the suit, and their defence to the suit did not substantially differ from it.

The medical evidence on behalf of the defendants was to the effect that there is no great nuisance except in hot and dry weather. There is often hot and dry weather in this country, and the inhabitants are entitled to have their air and water pure whatever the weather may be. A defence of prescription was set up, but it was admitted that there was no prescription in favour of the public nuisance, but only in respect of the private rights. If fouling a river for miles was not a public nuisance, it is difficult to say what would be one. But there really was no pretence in this case for saying that there was any prescription whatever, as was shown by the evidence which gave the history of what had been done. Formerly there was no system of drainage; the modern system had been adopted under the statutory powers since 1853, and mainly since 1862. The evidence on this point was uncontradicted, and after that it would be idle to say that there had been any previous enjoyment of a right to create a nuisance, either public or private in this river. It was, however, said that some of the landowners knew of the works which were being constructed, and did not interfere to stop them; that they stood by and allowed great expense to be incurred without objection. It was quite clear that no person is obliged to file a bill until he knows that an injury is being caused to him: he has a right to assume that local authorities will take such steps as the law obliges them to take to prevent a nuisance. The plaintiffs' case was wholly made out, and that of the defendants wholly failed. The appeal must be dismissed with costs.

The Lord Chancellor was of the same opinion. His lordship thought that, without undoing what had been already done in the present case, the nuisance could be abated.

Lord Justice Mellish also concurred in dismissing the appeal.

A PROJECT FOR RAILWAY ENGINEERS.

SIR,—There appears to be much necessity for railway communication in the West End of London north and south. A glance at the map of the Metropolitan and District Railways shows at once ample communication east and west, and if one happens to be near one of their stations the journey to or from the City is all that can be desired. But suppose you are midway between these railways, say in Oxford-street, in Mayfair, in Piccadilly, or in Bond-street, these railways afford very little accommodation, for while you are walking to them you may be far on your way by omnibus, east or west. Again, suppose you arrive by the London, Brighton, and South Coast, or the London, Chatham, and Dover railways at Victoria Station, and wish to reach North London, say Regent's Park, or even the central portion of Oxford-street or Regent's-circus, you must walk or take a cab. No omnibus attempts to explore the labyrinth of Mayfair; none takes any route except the red ones to the Marble Arch and the yellow ones to Tottenham-court-road; thus a long range of important and populous streets have no conveyance whatever, except cabs, between these points (a mile and a quarter asunder) and the great Victoria Station. Railway engineers might do worse than consider how to remedy this, and one way appears possible, viz., to construct a railway from Victoria District Station underground, northwards under Grosvenor-place or the gardens of Buckingham Palace, under part of Hyde Park, or Park-lane and Mayfair, thence to Baker-street or Portland-road, and thence northwards to Chalk Farm or Camden Station.

At first sight the objection would be the sewers and main drainage and the junctions, but let us also remember how that tunnel was made under the Thames at Tower-hill: the level at Victoria is low enough to pass under everything else, and if openings are wanted for air, &c., there are parts of Mayfair, or Hyde Park, and elsewhere eligible for the stations, &c.

True, there is to be a railway some day from Euston to Charing-cross, but that leaves the western area untouched, and the map will even then present a long space without any useful connexion between north and south. This may be worth consideration by engineers, and if they want to know where to deposit the earth when excavated, there are abundant opportunities for mounds and landscape gardening in the parks close at hand. H. C.

THE MILL MONUMENT.

SIR,—As I am not aware that any site has been definitely fixed upon for placing the statue of John Stuart Mill, I would suggest the pretty garden which is situated between Westminster Abbey and the Houses of Parliament. I think a more suitable spot than this could not be found in London, it having the advantage of being in the very heart of the district which he at one time represented in Parliament.

A READER OF HIS AUTOBIOGRAPHY.

PUBLIC HEALTH ACT.

A MISPRINT in a recent review of "A Manual of Public Health," p. 103, *ante*, has brought us two or three letters. The reviewer is made to say, "In the case of epidemics the Act confers the powers to prevent people from visiting infected houses." It should be "confers *no* powers." One correspondent, a medical officer of health, goes farther, and says, the succeeding statement, that the Act gives no power to prevent overcrowding, unless there is more than one family occupying one tenement, is incorrect. "By the Sanitary Act, 1866, '*any* house or part of a house so overcrowded as to be dangerous or prejudicial to the health of the inmates, is made a nuisance." Has he enforced this?

The "Digest of the Statutes relating to Rural Sanitary Authorities," published by command, dated from the Local Government Board, March 19th, 1873, and which is a text-book, says, "The sanitary authority, upon the certificate of the medical officer of health that any house is so overcrowded as to be dangerous or prejudicial to the health of the inhabitants, *consisting of more than one family*, must cause proceedings," &c. Sanitary authorities find themselves powerless on account of the interpolation, "consisting of more than one family." We know of towns that have had fever in cases almost by the hundred, in large overcrowded families,—well-to-do pitmen and many others—living in one room; but the authority would take no action on account of the overcrowding, because the inmates belonged to *one family*.

SCHOOLS OF ART.

The Warrington School.—The annual meeting of the subscribers and friends of this school has been held in the local Museum. The chair was taken by Mr. Pierpoint, J.P. The secretary (Mr. Milner) read the report, which stated that the number of persons receiving instruction in drawing, in or through the agency of the school, during the year ending July, 1873, was 371. This number includes 166 students who have attended the school. The school received one bronze medal, one prize of books at the national competition; 10 third-grade prizes of books were awarded to students whose works were sent up for inspection, and 16 second-grade prizes were awarded at the local examination; 109 students sent 387 works to the annual examination in London; 92 candidates presented themselves at the annual examination, of whom 60 were successful in passing one or more exercises. An exhibition of the students' works took place in April, and was attended by 2,075 visitors. Free studentships were conferred by the Department of Science and Art on Benjamin Jameson, and John A. Sherlock for sufficient and satisfactory works during the year. Free studentships are renewable, unlimited in number, but only obtainable by artizans. Mr. J. C. Thompson, the master of the school, has received the grant of the Department each year since its commencement. In addition to the above, Mr. Thompson has also been awarded, being the fifth year in succession, one of the bonuses offered to the head-master of the art schools by the Committee of Council on Education for the general amount of work, as tested by examinations, considered with reference to the number of students under instruction, being most satisfactory. Mr. John A. Sherlock, decorative painter, has obtained a national scholarship at South Kensington, value 50*l.* per annum. He availed himself for four years of the advantages offered by the instruction given in the school. During that time he has obtained several third-grade and national competition prizes at South Kensington. In addition to the above, he has received from the Department of Art free studentships in the School of Art for the year commencing August, 1870, '71, '72, '73, for satisfactory and successful work and attention to his studies. The report was adopted.

The Sheffield School of Art.—The annual *conversazione* of this school took place in the building in Surrey-street. There was a numerous attendance. The council of the school have succeeded in obtaining a collection of oil and water-colour drawings, mainly from local galleries. The *conversazione* commenced at six o'clock, and at eight o'clock an adjournment was made to the lower class-room, where the distribution of prizes took place. In the unavoidable absence of the Rev. Rowley Hill, the chair was taken by Mr. W. Bragge. Mr. Bragge, in opening the proceedings, said he wished to congratulate the people of Sheffield on the real, thorough progress which that school had made. It was earning higher premiums, and more in number, than ever were earned before. Still, the school was a great deal too small for the town. There ought to be many such schools in the town, instead of one, and many worthy masters and teachers, instead of the half-dozen who were now engaged. He wished to say a few words on behalf of what had long been a plan and a project cherished and entertained by him with all his heart. He wanted to see established in Sheffield a metal-work museum. If they could get in Sheffield, which he was sure they could, a metal-work museum, where the cutler shall see the most original, the earliest cutlery that the world can show; where he shall see specimens of the whole of the historic period, of the Mediæval period, and come down to the present time; where he shall see every article dissected and laid before him, so far as they could be, did they not think that that would cause the cutler to entertain a much higher opinion of his art than he did before? He appealed to the gentlemen of Sheffield to help him in carrying out his object, which he so earnestly desired to see fulfilled. Of course there were great difficulties in the way; and the first difficulty was to find a place. They had in the house in Miss Harrison's grounds a building which, with very little internal alteration, could be made a very useful building. Behind it could be thrown out galleries to any extent they desired, and there were the building materials upon the premises. The expense of doing this would be really quite within the means of any private gentleman who chose to undertake it. The house was the property of the municipality, and he hoped before they met in that room again it would be altered and devoted to the purpose for which they desired it. The money which they had spent there would come back to them in Sheffield tenfold. He had a strong desire to get their help and co-operation in carrying out this metal-work collection at as early a period as possible.

The Maidstone School of Art.—A correspondent of the *South Eastern Gazette* calls attention to the declining state of this school. "At first sight (he says) it does not appear why the school declines; it certainly is not for the lack of local talent, for by the reports printed by the committee for the last few years, it is proved that, in proportion to the numbers of the scholars, our school has taken as many prizes from South Kensington, and more than the generality of schools in the United Kingdom. I think the secret is in the management of the school; for although there are the names of many influential gentlemen down as committee-men on the first page of the report for this year, I am sorry to say that, with but a few exceptions, they take no active interest in the welfare of the institution. In fact, almost the whole of the work devolves upon Mr. Collis, to whom the students owe a deep debt of gratitude for his energy, and the interest he takes in the affairs of the school." He thinks it is "very plain that unless the gentlemen of the committee use their influence more vigorously to promote the interests of the School of Art, it must shortly do what most good things do in Maidstone, that is, die a natural death."

VARIORUM.

"ELECTRO-SYMPATHETIC Clocks and Time Signals," by F. J. Ritchie, Leith-street, Edinburgh (Neill & Co., printers). This is a pamphlet comprising a paper read before the Royal Scottish Society of Arts in April, 1873, and awarded the Read and Auld Prize for Session, 1873. The subject is one which has received much attention from Mr. Ritchie and others at Edinburgh, where electric clocks and time signals have been long in practical use.——According to *Iron* our Antipodes has just revealed a new mineral—a white coal—which is fibrous, easily combustible, and burns with a light flame and no smoke. Nor is the material rare; large districts are covered with it, and it lies on or very near the surface. The coal is a species of lignite, and the colour is most likely due to the absence of bitumen.

Miscellanea.

Projects in Parliament affecting the City of London.—A report on railways, tramways, and other projects affecting the City has been made by Mr. Haywood to the Sewers Commissioners. There are nine projects:—1. Metropolitan inner circle completion and Eastern Extension Railway; 2. Aldgate and Cannon-street Railway and completion of inner circle; 3. Great Eastern and South-Eastern Junction Railway; 4. Great Eastern Railway, additional lands; 5. North London Railway, additional powers; 6. New Mint building site; 7. North Metropolitan tramways; 8. South-Eastern Railway, pneumatic tube; 9. General Post-Office plan. The railway projects will much interfere with the sewers, and to insure a position for the Commissioners, must be objected to by them, and arrangements as to replacement of the sewers, &c., secured, if the projects are not otherwise interfered with. The completion of the inner circle railway will go by tunnel from the District Terminus, by Queen-street, Cannon-street, Gracechurch-street, and Fenchurch-street, to Aldgate Pump and Harrow-alley.

The Condition of Worcester Townhall. At a recent meeting of the Worcester council, Mr. W. Holland read a report of the survey of buildings and property committee, which stated that, at the last meeting of the committee, Mr. Rowe presented his report on the works done to the townhall, under the recommendation of the council on the 25th of August last. He also stated that the cost of the repairs, up to the present time, including those to the roof, now nearly completed, would amount to about 260*l.*; and that further repairs were necessary to the extent of 120*l.*, besides the painting of the external wood and iron work. Mr. Holland, after reading the report, went on to say that Mr. Rowe had found the dilapidations to be so much greater than he expected, that the sum originally voted was not sufficient, and stated that even after the 120*l.* had been spent, he would not guarantee that the building would be safe for the ordinary uses of a guildhall,—for instance, for the holding of large meetings. Having gone so far, however, it was a question, Mr. Holland said, whether they would be wise in declining to authorise the further expenditure, leaving the hall in an unfinished state. Mr. Longmore moved that the necessary work be proceeded with, and the extra sum of 120*l.* be granted. As to the safety of the building, he said there was an enormous meeting held in it the other night with perfect safety, and he heard several persons remark that if it would stand that it would stand anything. After a discussion Mr. Longmore's motion was put to the meeting and lost by ten to nine, the mayor's vote deciding the question.

Ashantee Architecture.—The special correspondent of the *Times* sends some items of information on this subject which may be usefully recorded:—"My house is plain and primæval—a house stark naked, so to speak; for no part of it is clothed with plaster or clay. Two stout posts, notched at the upper end, support a horizontal beam, from which eight palm rods slope down on either side and rest upon the walls. A layer of palm leaves placed upon these constitutes the thatch. The walls are of split pieces of palm, bound together with the fibres of the tree. The door is of the same material, the fibrous cord being adjusted as a hinge." . . . "The traveller Bowditch has often been accused of using too much colour in his descriptions of this country, but I do not think that he has exaggerated the merits of Ashantee architecture. It has more of the old Egyptian than of the Arab character. An Ashantee mansion is composed of courtyards, which are thoroughfares leading into one another; each courtyard is square in shape, with often a tree planted in the midst. Round the yard are rooms or alcoves raised above the ground, and thatched overhead. The front of the alcove looks on the yard, and a drop curtain of matwork obtains seclusion for its inmates. The dais or platform which forms the floor of each alcove is painted with a coating of clay, in colour a deep rich Etruscan red, with a beautiful polish. The walls are washed with white clay, which the natives of the Gold Coast often take as a medicine in water or chew as a sweetmeat. The walls are also decorated with strange and tasteful designs. Gutters on the ground and wooden pipes between the sloping thatched roofs are neatly arranged for carrying rainwater away."

Opening of a New Moravian Sunday School at Fulneck, Leeds.—A public tea meeting to commemorate the opening of a new Moravian Sunday School for boys at Fulneck has been held, under the presidency of Mr. W. Middleton, J.P., the chairman of the Leeds Board of Guardians. There was a large attendance. The new school, which has been erected on the side of the hill at the back of the settlement of the Moravian Brethren, has a frontage of 33 ft. 6 in., and a uniform depth of 87 ft. Its height is 17 ft. from floor to eaves line, and it is faced with pitch-faced wall-stones, with ashlar dressings. The style of architecture is Italian, in harmony with the present buildings at Fulneck. The general school-room is 51 ft. by 30 ft., and there are two class-rooms, 15 ft. by 11 ft., approached from the principal entrance, which is 6 ft. wide. There are also two rooms at the west end, 16 ft. by 14 ft. 6 in., one of which will be used as an infants' class-room, and the other as a tea-room. The total cost has been 1,500*l.* The works have been executed under the superintendence of Messrs. C. S. & A. J. Nelson, of Leeds, architects.

The Inventors' Institute.—A meeting of this society has been held at the offices of the Institute, 4, St. Martin's-place, Trafalgar-square, for the purpose of hearing a paper read by Mr. P. A. Blake, on "Suppressing Fires by novel automatic means, indicating the presence thereof in buildings." Mr. Yates occupied the chair. After a few introductory remarks from the chairman, who pointed out the importance of the subject, Mr. Blake proceeded to read his paper. He stated that 2,000 fires occurred in London annually, and that through their means many scores of lives were lost. This state of things required to be remedied. The late money panic in America had been ascribed to fire, and it was estimated that the amount of damage done by it in that country would reach the sum of 110,000,000*l.* or 120,000,000*l.* If fires were taken at their commencement, it was easy to extinguish them, but if they were not, it was exceedingly difficult to check them. What he proposed was to have an apparatus which would give notice of fire from its commencement, and thus enable it to be easily extinguished. He proposed to have the inside of buildings hung with fuses, easily ignited, connected with maroons. Directly a fire occurred in a house, the fuse would become ignited by the heat, and ignite maroons, the explosion of which would immediately give an alarm. If this safeguard were adopted, he believed there would almost be an end of the dreadful calamities which had occurred of late. At the conclusion of the reading of the paper a short discussion ensued.

Belfast Architectural Association.—At a meeting on the 16th inst., Mr. Robert Young in the chair, a paper was read by Mr. John Boyd, architect, on "The Effects of Water, Wind, and Frost, on Public Buildings." The first portion of the paper referred principally to damp, arising from different sources—1, from below, or foundations; 2, from above, or the roof; 3, from the sides, or walls; and, 4, from incidental sources—in which the varied causes were pointed out, and remedies suggested. With regard to the effects of wind on buildings, Mr. Boyd pointed out a number of recent cases where accidents took place from various erections falling during a gale. He also gave examples of how to calculate the effects of hurricanes on buildings. In the third case, the effects of frost on stone were shown to be greatest on the north and north-east sides of buildings, and on the under side and beneath cornices and projections, from the fact of the sun not shining on these so much as on the south and west. After the frost has commenced the disintegrating process, the various acids in the atmosphere of London and our large manufacturing towns come to its assistance, and the work of dissolution progresses.

Munificent Bequest to Barnard Castle.—Since the death of Mrs. Bowes (wife of Mr. John Bowes, of Streatlam Castle), which has just occurred at the family residence in Paris, it has been stated on authority that the magnificent building now in course of erection at Barnard Castle, and of which we recently spoke, together with the park and a large and valuable collection of paintings, statuary, and other works of art and curiosity, which have been selected by Mrs. Bowes (Countess of Montalbo) and her husband during the course of a long series of years, will ultimately be given to the inhabitants of the town. The name will, it would appear, be "The Josephine and John Bowes Museum and Park." In accordance with the expressed wish of Mrs. Bowes, her remains will eventually repose in the chapel which is to be erected in connexion with the museum. The natural appreciation and acquired knowledge of art with which this lady was gifted were well known, and by her death there has been removed one of the most refined and able advisers in the undertaking. It is not improbable, considering the amount of carving and ornamentation to be carried out internally and externally, that some years will yet elapse before the museum is thrown open to the public.

Road Paving.—Sir: In macadamising a road, which is now done with broken granite, water, fine gravel, and the steam-roller, if *hot tar* were used in the place of the water, would it not make a smooth clean road, both free from dust in dry and mud in wet weather; not slippery in dry, wet, or muggy weather, and easily cleansed? Footpaths in the suburbs made on a somewhat similar method have proved satisfactory, being pleasant to walk on in all weathers, because of their clean even surface.—E. J. B.

The Oxford Architectural and Historical Society.—This Saturday, Feb. 28, it is proposed to meet in the Ashmolean Museum, where, in the absence of the keeper, Mr. J. P. Earwaker (deputy-keeper) will receive the members and their friends, and will give a short account of the museum and its recent re-arrangement. Mr. W. S. W. Vaux will describe the Arundel Marbles, and Professor Westwood will describe the ivories, &c.—Saturday, March 7th. Headington and Marston Churches. It is proposed to assemble in the parks, by the lodge of the New Museum, and to walk thence, crossing the Ferry from the University walks to the meadows, to Marston (two miles). Marston Church is, as regards the main structure, of late twelfth-century date, with alterations and additions of the fifteenth century. From Marston the party will walk to Headington Church. At the evening meeting, February 24th, Mr. J. P. Earwaker will give an account of the recent archæological discoveries in the neighbourhood of Oxford, illustrated by a fine collection of Roman remains from Dorchester, and many other objects of interest, Saxon and Mediæval.

The City Courts of Justice.—A proposition has been laid before the court of aldermen to abolish the Mansion House as a police-court, and to concentrate the whole of the City business under one office at the Guildhall. The present police-court at Guildhall would be found totally inadequate for the additional business that would be brought to it, supposing this arrangement to be carried out, and a large and commodious court would be built, either upon the present site of the Guildhall police-court, or in some other portion of the building. The present Mansion House would then be devoted entirely to the purposes of a private residence for the Lord Mayor, and the justice-room and other places now applied to the purposes of the police business would then be made available for occasions of grand receptions, banquets, &c. It appears to be the opinion of many persons well acquainted with the subject, however, that there would be difficulty in carrying out the proposed plan.

The Hospital for Sick Children.—The festival of this deserving charity was held on the 11th inst., at Willis's Rooms, under the presidency of Sir Francis Goldsmid, bart., who stated that the new buildings in Great Ormond-street are progressing rapidly, from the designs of Mr. E. M. Barry, R.A. Eloquent speeches were made by Lord Gort, Sir James Paget, Mr. Goldwin Smith, Dr. West, Sir F. Goldsmid, and others; and in proposing the Press, allusion was made to the *Builder* as having forwarded the interests of the charity by its illustrations, which had even attracted notice in Russia, where the erection of a children's hospital is in contemplation. A list of subscriptions was announced, and urgent appeals were made to the public for further assistance, to enable the committee to complete the new hospital, part of which only has, as yet, been commenced.

On Glass.—A lecture on "Facts and Fancies connected with Glass," was delivered in the Reading-room of the Runcorn Literary and Mechanics' Institute, by Mr. W. Lyon, on Friday evening last. The lecturer reviewed the history of glass, its manufacture, materials, uses, and the great service it has rendered to various scientific pursuits. He affirmed that glass existed some hundreds of years before the Christian era, and named several Eastern countries in which articles of glass were esteemed and treated as of great value; and said that as recently as three hundred years ago, the sons of noblemen in France thought it a great honour to be permitted to learn the art of glass-making, and so highly was the privilege esteemed that the wealthiest families in the land were eager to court the acquaintance of those engaged in the trade.

Restoration of St. Martin's Church, Birmingham.—The committee for the restoration of St. Martin's Church, at their last meeting, determined to proceed with the erection of the chancel, chancel aisles, and vestries, and thus complete the whole of the building according to the architect's designs. The amount required for this purpose, however, far exceeds the total sum as yet subscribed. 2,000*l.* have already been received on account of the voluntary assessment, and the committee hope that, as the whole of the work is now in progress, those who have not paid their assessment will do so, and thus help to defray the large outlay for which the committee has become responsible.

An Electric Thermometer for Fire Alarms. — At the last week's meeting of the Metropolitan Board of Works, a letter was submitted from Mr. Charles F. Clyatt, consulting engineer of the Signals Telegraph Company, offering to lay before them a simple invention applicable alike to public buildings and private houses, which would convey an instantaneous alarm at the very earliest commencement of a fire. This end is gained by fixing to every floor of a building an electric thermometer, connected by wires with a central point in the building, and also with the nearest fire-brigade station, conveying at once an alarm the moment the slightest degree of heat above the ordinary temperature is reached. The cost of fixing the apparatus would be only small. The letter was referred to the Fire Brigade Committee for consideration and report.

International Exhibition of 1874.—The Council of the Society of Arts have resolved to offer the Society's Gold and Silver Medals in connexion with the International Exhibition of 1874. These will be offered in each class, and for any object exhibited which, in the opinion of the council, shows paramount or very great excellence. M. Ozenne and M. du Sommerard have arrived in London to make final arrangements for the representation of French art and industry in the present year's exhibition. They state that French artists are making large demands for the admission of their pictures and works of art. The city of Paris will exhibit an extensive illustration of the municipal works of Paris, accompanied by models of public buildings, sanitary appliances, &c. This display excited much interest at Vienna.

Lincoln Tower of Christ Church, Lambeth.—At a temperance meeting, recently held in Surrey Chapel, the Rev. A. Cay, vicar of Whetstone, who presided, said that he had read some censures on the proposal to erect a tower to cost 7,000*l.*, in commemoration of the emancipation of the slaves in America. For his own part, he rejoiced in it. Surely it was not too much to spend on a monument to commemorate the greatest philanthropic event of our day, and he wished to give the price of a dozen bricks. The tower in question is international. Half the amount has already been given by American citizens for this express purpose; and 2,000*l.* have already been specially contributed in this country towards the English contingent of this token of international goodwill.

Opening of a Working Men's Reading Room at Flimby.—A new building, intended for a Working Men's Reading Room, has been opened at Flimby. The foundation-stone of this building, which is a concrete one, from a design by Messrs. C. Eaglesfield & Sons, of Maryport, architects, was laid in July last. The edifice consists of a reading-room 18 ft. by 12 ft., a committee-room, 16 ft. by 9 ft.; a public hall, 40 ft. 10 in. by 23 ft. The estimated cost of the structure, including the furniture, is upwards of 715*l.* The contractors for the concrete and joiners' work were Messrs. Banks, Mandle, & Co., of Maryport; for the plastering and cementing, Mr. Waller, of Cockermouth; and for the plumbing and glazing, Mr. Piele, of Workington.

Ossett Main Drainage.—On Monday evening, the 23rd inst. at a meeting of the Ossett Local Board, Mr. M. Paterson of Dewsbury, presented working plans and sections of the proposed main drainage of the entire district. It is intended to provide for manufacturing refuse water, as well as the house sewage and road drainage; and the works involve two separate main outfalls, besides four outlying sewers which cannot be otherwise dealt with. There are about twelve miles of brick and pipe sewers. The method of sewage treatment proposed is that of rough precipitation in settling tanks combined with land filtration. The estimate is 22 272*l.*, and includes the cost of the sewage works, land, &c.

Gravesend and the Duke and Duchess of Edinburgh.—The Gravesend Reception Committee have accepted tenders for the erection of about 1,300 seats on the Terrace Pier, and about 1,000 seats just outside the pier. The Decoration Committee met to decide upon tenders for decorations. Messrs. Defries, Davis, Edgington, and two local tradesmen, Messrs. Bird & Cooper being in the field. The Committee, having considered the proposals and plans submitted for a couple of hours, were unable to come to a decision, and referred the matter to a sub-committee.

Institution of Surveyors. — The Duke of Bedford has presented the following costly works to the library: — Eyton's "History of Shropshire," Thoroton's "History of Nottinghamshire," Warner's "History of Hampshire," Gilbert's "History of Cornwall," Atkyn's "History of Gloucestershire," Suckling's "History of Suffolk," Bridge's "History of Northamptonshire," Surtee's "History of Durham," Thoresby's "History of Leeds," Dallaway's "History of Sussex. At the next meeting to be held on March 2nd, a paper will be read by Mr. D. Watney, entitled "Timber"; and the discussion on the paper by Mr. Ralph William Clutton, entitled "The Self-sown Oak Woods of Sussex," will be resumed.

The Preservation of Clapham-common. The Metropolitan Board of Works have purchased the manorial rights and privileges of the lord of the manor in Clapham-common, and the interests, &c., are to be conveyed to the Board for the purpose of securing the common as an open space for the public in perpetuity. The common comprises 250 acres of land, and the sum demanded was 33,000*l.*; but after much negotiation the interests of the lord of the manor have been purchased for 18,000*l.* The Board of Works will deal with the rights of the commoners having the privilege of pasturage, &c., and the common will remain intact and will not be built upon.

The Proposed Tunnel under the Tees.—At the half-yearly meeting of the North-Eastern Railway Company, it was stated that the result of Mr. Harrison's examination had been to show that there is a stiff bed of clay under the Tees, where there would be no difficulty in putting the proposed tunnel. The line would be about six miles. Including the tunnel, which would be 2,310 yards in length, the short line across the river would be three miles. The cost of the line was estimated at 387,000*l.* In respect of the tunnel, which would cost nearly half that sum, they sought power to charge tolls as for four miles.

Tunnel at Cowes.—Works are now in progress under the direction of Mr. Vignoles, engineer, with a view to ascertaining the practicability of a submarine-tunnel to connect the Isle of Wight with the mainland. The spot selected is the narrow part of the Solent just to the westward of Cowes, the actual width of the sea here not being more than one mile and three quarters. Experiments are now being carried on by Mr. Prichard, the contractor, to ascertain the nature of the soil through which the tunnel would have to run, and up to the present time the results have been eminently satisfactory.

Lecture on the Goldsmith's Art. — In connexion with the exhibition of the Goldsmith's Company's competition drawings now open, a lecture will be given on this, Saturday, February 28th, at the Architectural Museum, on Ancient and Modern Goldsmith's Art, by Mr. F. A. Skidmore, — a good authority. The Fishmongers' Company have lately made a donation of fifty guineas to the museum towards the maintenance of the art-workmen's evening drawing and modelling classes carried on in the building.

The Free Libraries Act for Macclesfield. Last week a public meeting, convened by the mayor, was held in the Town-hall, Macclesfield, and the Free Libraries Act, 1855, was adopted, on the motion of Mr. Alderman Bullock, seconded by Mr. Nicholson. The question was brought forward in order to enable the town to take advantage of an offer of 5,000*l.* for the erection of a building, and furnishing it with 10,000 volumes of books.

New Gaol at Portsmouth.—At a meeting of the Portsmouth Town Council held in the Guildhall, on Monday, it was resolved, on the motion of Mr. Howell, seconded by Mr. Murrell, to adopt the report of the Gaol Committee, which recommended the building of a new gaol at Copnor, upon the plan furnished by Mr. G. Rake, at a cost of between 30,000*l.* and 40,000*l.*, and authority was given to raise the necessary funds on loan.

The St. Gothard Tunnel Blasting. — It is stated that a plan has been successfully adopted for firing at the same moment various blasts in the St. Gothard Tunnel by means of electricity. Hitherto there has been loss of time from the difficulty in adjusting the length of the fuses so as to accomplish the explosion of all the blasts at once; and a loss of power, moreover, from the want of simultaneous action.

The Sub-Wealden Boring.—In the *Sussex Express*, Mr. Peyton states that the Diamond Rock-boring Company commenced work on the 12th inst., and they had reached a depth of 353 ft., giving a total of 40 ft. in three days' work. Whilst looking on they bored down 6 in. in ten minutes! The cores are 2 in. in diameter, and are brought to the surface in perfect condition, one being no less than 7 ft. long, still from the Kimmeridge clay.

Royal Humane Society. — Next April, a hundred years will have elapsed since the foundation of this Society, and the committee have decided on holding a Centenary Festival, at which his Royal Highness the Duke of Edinburgh has expressed his intention of presiding, to celebrate the great success which has resulted from its exertions.

Art Founders' Trade Book.—Messrs. Allen & Co., late Turner & Allen, of Upper Thames-street, have issued a trade-book prepared at some cost. It includes a large number of designs for lamps, lamp standards, candelabra, pillars, gates, railings, and fountains,—mostly "Classical" in style. Some of the designs are very good of their kind.

Workmen's Dinner.—The roof of the large mansion now building at Hill-head, opposite Cones, on the banks of the Solent, being successfully fixed, the owner, Sir Frederick H. Sykes, bart., invited the whole of the *employés* to dinner on the 19th inst. Mr. Goodchild, of the Adelphi, is the architect, and Mr. George Baines Pussen is the contractor.

Competition. — Designs have been sent in for Board Schools at South Norwood for the Croydon School Board by four architects out of the six invited; namely, Mr. Robson, of the London School Board; Mr. C. Henman, Mr. C. Rutley, and Mr. Mullet. The designs are sent in under mottoes.

Sale of a County Prison. — The very unusual occurrence of a prison being sold by auction occurred the other day at Abingdon. It was built some sixty years since for 26,000*l.*, and was in sound preservation. The reserved price was 2,000*l.*, and it fell to the bid of Messrs. R. Clarke & Co., the clothiers, of Bristol, for 2,700*l.*

Fatal Fall of an Ice-House.—The Philadelphia correspondent of the *Times* telegraphs that a brewery ice-house, in Philadelphia, while being filled, has fallen in from over-pressure. Thirty persons were buried in the ruins, of whom eleven were killed and seventeen injured. Two were still missing.

Sewer Ventilation required at Cambridge.—The Cambridge Urban Sanitary Authority having instructed their surveyor "to report what steps should be taken to provide ventilation for the town sewers," Mr. Stephenson has prepared his report on the subject, with practical suggestions, especially as to cleansing and flushing the sewers forthwith.

Hospitals and Ventilation.—On Monday evening next, the 2nd of March, Dr. Charles Shrimpton will read a paper at a meeting of the Social Science Association, to be held at their rooms in the Adelphi, on "Hospitals, Cottage Hospitals, and Ventilation," at eight o'clock.

The National Gallery.—Mr. F. Burton is announced as the successor of Sir W. Boxall, R.A., who retires from the directorship on the ground of ill-health.

TENDERS

For Board Schools, at Warlingham, Surrey. Mr. C. Rutley, architect:—

Peskett & Taylor	£987 0
Jarrett	973 0 0
Taylor & Son	931 0 0
Hearle	867 0 0
Ward (accepted)	853 0 0

For New Farm buildings, Northern Woods, Wooburn, Bucks, for Mr. A. Gilbey. Mr. A. Vernon, architect:—

Woodbridge	£695 0 0
Hunt	692 0 0
Williams	690 0 0
Corby	675 0 0
Webb	667 10 0
Baughurst	618 0 0
Sexton (accepted)	564 0 0

For the erection of additions to the St. Peter's Schools Hackney-road. Mr. Rogers, architect:—

Beales	£710 0 0
Forest	659 0 0
Judd & Hawkings	610 0 0
Ball & Wick	497 0 0
Bradford	496 0 0

For Channelsea Schools, for the West Ham School Board. Mr. J. I. Newman, architect. Quantities supplied by Messrs. R. L. Curtis & Sons :—

Charlton & Martin	£2,145	0	0
North	2,075	0	0
Abrahams	1,999	0	0
Favitt	1,987	0	0
King & Son	1,982	0	0
Wicks, Bangs, & Co.	1,890	0	0
Rivett	1,887	0	0
Knight & Duslow	1,838	10	0
Webber	1,827	0	0
Hoskings (accepted)	1,707	0	0

For new factory at rear of No. 50, Leadenhall-street, City, for Messrs. Field & Tuer. Mr. J. I. Newman, architect. Quantities supplied by Messrs. R. L. Curtis & Sons :—

Foster	£1,340	0	0
Sharpington & Cole	1,277	0	0
Cooke & Green	1,259	0	0
Wicks, Bangs, & Co.	1,249	0	0
King & Son	1,234	0	0
Elkington (accepted)	1,130	0	0

For Licensed Victuallers' Asylum, Old Kent-road, for repairs to be done to the houses, and to the external stone paving, &c. Mr. W. F. Potter, architect :—

Maxwell, Bros.	£230	0	0
King	222	4	0
Burningham & Co.	217	5	0
Hall & Son	198	0	0
Hayworth	140	0	0
Hersee	139	10	0
Stace (accepted)	122	10	0

For the erection of a villa residence, at West-hill, Southport, for Mr. P. Rothwell. Messrs. Balmer & Garside, architects. Quantities supplied :—

Duxfield	£1,500	0	0
Wishart & Irving	1,489	0	0
Nixon	1,455	0	0
Wilkinson	1,400	0	0
Russel (accepted)	1,376	0	0

For forming new road on the Mile-Mead Estate, Guildford. Messrs. E. W. Lower & Son, architects :—

Mitchell & Son	£1,697	0	0
Patrick	1,250	0	0
Martin, Wells, & Co.	1,250	0	0
Carter	1,210	0	0
Symonds	1,160	0	0
Gardner (accepted)	1,079	0	0
Haynes	895	0	0

For alterations and enlargement of premises at 70, King's-road, Chelsea, for Messrs. Edmonds & Butler. Mr. C. L. Luck, architect :—

Manley & Rogers	£482	13	0
Little	476	0	0
Stimpson	465	0	0
Hockey	443	10	0
Foster	385	0	0
Perren	384	0	0
Brass & Sons	358	0	0
Clark (accepted)	336	0	0

For Bond End Schools. Messrs. Giles & Brookhouse, architects. Quantities supplied :—

Hadfield	£1,980	0	0
Slater & Vernon	1,971	10	0
Potter	1,941	5	6
Smith	1,940	0	0
Fox	1,922	8	0
Chamberlain	1,702	0	0
Bowler & Beck	1,640	0	0
Mason	1,628	0	0
De Ville	1,592	0	0
Maddocks	1,552	0	0
Bennett	1,540	10	0
Wileman (accepted)	1,530	0	0

For Cattle Sales Company's yard and premises, exclusive of road and foundations, Burton-on-Trent. Messrs. Giles & Brookhouse, architects. Quantities supplied :—

Chamberlain	£3,670	0	0
Mason	3,498	0	0
Lowe & Sons	3,495	0	0
De Ville	3,489	0	0
Bowler & Beck	3,366	0	0

For Victoria-road Schools, Burton-on-Trent District School Boad. Messrs. Giles & Brookhouse, architects. Quantities supplied :—

Wileman	£5,159	0	0
Maddocks	5,053	0	0
Slater & Vernon	5,043	0	0
Potter	4,931	0	0
De Ville	4,890	0	0
Parnell & Son	4,889	0	0
Bowler & Bock	4,737	0	0
Chamberlain	4,730	0	0
Bennett	4,622	0	0
Mason	4,615	0	0
Dusantoy (accepted)	4,448	0	0

For Branstone School. Messrs. Giles & Brookhouse, architects. Quantities supplied :—

Smith	£1,161	0	0
Chamberlain	1,131	0	0
Bennett	1,115	0	0
Mason	1,110	0	0
Slater & Vernon (accepted)	925	0	0

For Winshill Schools. Messrs. Giles & Brookhouse, architects. Quantities supplied :—

Slater & Vernon	£1,998	10	0
Potter	1,939	0	0
Smith	1,910	0	0
Fox	1,864	10	0
Hadfield	1,850	0	0
De Ville	1,767	10	0
Mason	1,750	0	0
Chamberlain	1,733	0	0
Maddocks	1,730	0	0
Wileman	1,717	0	0
Bowler & Beck	1,717	0	0
Bennett (accepted)	1,677	10	0

For new billiard-room, at Ridgeway Oaks, Enfield. Mr. T. J. Hill, architect :—

L. & W. D. Patman (accepted)	£540	0	0

For new offices in Edmonton. Mr. T. J. Hill, architect :—

Bayes & Ramage	£370	0	0
L. & W. D. Patman	313	0	0
Ward	278	0	0

For building a villa at Richmond-hill Rise, Surrey, for Mr. C. Burt. Mr. W. Burnet, architect. Quantities by G. Gordon Stanham :—

Brass	£4,781	0	0
Clark & Bracey	4,739	0	0
Chamberlain	4,450	0	0
Ockley	4,450	0	0
King & Son	4,080	0	0
Adamson & Sons	3,995	0	0
Sweet	3,994	0	0
Newman & Mann	3,886	0	0
Manley & Rogers	3,862	0	0
Carless	3,833	0	0
Simms	3,760	0	0

For farm buildings at Brinkley, near Newmarket. Mr. F. Thomson, architect. Quantities by Mr. W. Barnett :—

				Allowance for Old Materials.		
Mitham	£905	0	0	£70	0	0
White	865	0	0	35	0	0
Mason & Sons	880	15	0	72	0	0

For repairs and alterations at the "Cricketers," Lower Wandsworth-road, Battersea Park, for Mr. J. G. Poole. Messrs. Pain & Clark, architects :—

Sawyer (accepted)	£592	0	0

For new warehouse for Messrs. Hudson & Sons, 75 and 76, Wells-street, W. Mr. A. E. Hughes, architect :—

Richards	£1,965	0	0
Scrivener & White	1,926	0	0
Simpson & Baker	1,910	0	0
Longmire & Burge	1,910	0	0
Thorne & Co.	1,900	0	0
Taylor	1,897	0	0
Watson	1,842	0	0
Perkins	1,819	0	0
Fairchild	1,810	0	0
Hatchman	1,794	0	0
Hyde	1,770	0	0
Jossein & Co.	1,626	0	0

For proposed stables, &c., Dagmar-terrace, Islington, for Mr. E. Silver. Mr. J. Miller, architect :—

White	£2,200	0	0
McCamal	1,950	0	0
Ward	1,940	0	0
Taylor	1,930	0	0
Ebbs	1,775	0	0
Hyde	1,772	0	0
Bishop	1,685	0	0
Higgs	1,500	0	0

For alterations and additions to 90 and 92, Fulham-road, S.W., for Mr. Kingsbury. Mr. F. A. Dovey, architect :—

Langmead & Way	£535	0	0
Evers	520	0	0
Taylor	493	0	0
Wagner (accepted)	470	0	0

For re-building No. 2, Upper Rupert-street; repairs to No. 28, Princes-street, adjoining, and new shop fronts. Messrs. Newman & Hewitt, architects. No quantities :—

Tremble	£2,548	0	0
Patman & Fotheringham	2,098	0	0
Hobson	1,769	0	0
Hide	1,767	0	0
Foxley	1,718	0	0
Titmas	1,697	0	0

For decorations and other works to Nos 137 and 138, Tottenham-court-road, and No. 283, Euston-road, for Messrs. E. Moses & Son. Mr. H. H. Collins, architect. Quantities not supplied :—

Foxley	£655	0	0
Poole	627	0	0
Perry, Bros.	500	0	0
Newman & Mann	497	0	0
Vernall	456	0	0
Colls & Sons	440	0	0

For alterations and additions to Bedford Lodge, Hampstead, for Mr. J. Maple. Mr. H. Woodzell, architect. Quantities supplied :—

	Alterations.		New Wine Cellar.		Total.
Colls & Sons	£2,273	...	£25	...	£2,298
Fish	2,226	...	24	...	2,250
Ennor	2,193	...	26	...	2,219
Cooke & Green	2,176	...	24	...	2,200
Newman & Mann	2,170	...	26	...	2,196
Scrivener & White	1,988	...	23	...	2,011

For alterations and repairs to No. 1, London House-yard, St. Paul's Churchyard, for Miss Keating. Mr. H. Woodzell, architect —

Scrivener & White	£142	0	0
Newman & Mann	138	0	0
Child	115	10	0

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